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'SCRIPTURE FOR THE EYES'

How Dutch Printmakers Brought the Bible to Life and Spread Some Propaganda

By **KEN JOHNSON**



The Bible is a wild and crazy book. Abounding in sex, violence and supernatural happenings, it has been one of the great sources of inspiration for visual artists.

Just how provocative the Good Book has been can be seen in “Scripture for the Eyes: Bible Illustration in Netherlandish Prints of the 16th Century” at the Museum of Biblical Art. Among the 79 works in this superb show are pieces by some of the biggest names in Western printmaking. Woodcuts and engravings by Lucas van Leyden and Hendrick Goltzius alone would make a visit worthwhile.

In Lucas’s “Return of the Prodigal Son” (from about 1510), the emaciated, rag-clad wanderer kneels before his bearded father on a stony patch of ground outside the family manse. Groups of men in sumptuous costumes watch as a skinny dog sniffs about in the foreground, and a pair of thick-trunked trees rise in the background. Beyond, a bucolic landscape of farms, a river and mountains drawn with miniaturist precision extends into the distance. This paperback-size marvel of draftsmanship and engraving rivals the work of Dürer.

The exhibition’s curators, James Clifton, director of the Sarah Campbell Blaffer Foundation, and Walter S. Melion, an art historian at [Emory University](#), explain in catalog essays that biblical illustrations were more than accessories to the text. While they enabled the faithful to visualize and remember Bible stories, they also served to interpret them and to affirm church doctrine.

Images included in printed Bibles and published as single sheets were loaded with political and ideological import. With Protestants and Roman Catholics vying for European hearts and minds, the 16th century was a volatile, bloody time, and religious imagery had considerable value as propaganda.

Although it is unclear which side Lucas’s Prodigal Son print favors, both faiths could claim it as representing the return of the wayward from the depravity of the enemy camp.

Some of the issues animating Renaissance religious imagery are still broadly relevant today. A number of prints in the exhibition address the connection between the Old and New Testaments. How did the Bible of the Jews, Europe’s most demonized population, come to be integral to Christianity’s holy book?

Church fathers appropriated the Old Testament by reading its major characters and stories as

prefigurations of the advent and eventual triumph of Jesus. Artists produced extraordinarily complicated images symbolizing the unification of the texts.

In Pieter Nagel's "Allegory of Law and Grace," from 1567, a naked man sits on a coffin, an Old Testament prophet on his right and, to his left, John the Baptist, who points to an image of Jesus rising from his tomb. The "old" side, which has a tiny background vignette of Eve offering Adam the forbidden fruit, represents man's fall into sin and the corrective commandments of Moses. The "new" side offers redemption through the grace of Jesus. Mind you, this description oversimplifies a picture that is so bewilderingly rife with esoteric symbols that it could have been dreamed up by a heretical cultist. The curators point out that book and image printing developed in tandem. Along with vernacular translations of the Bible, they helped to spread the Word and, perhaps more significant, to promote literacy. The democratizing effects of these developments would in the long run help to undermine the authoritarian power of the dominant churches. That might be why the iconoclastic Protestants were less averse to more intimate printed images than to the glamorously sensual paintings and sculptures of Rome. A related aspect that is hinted at in the exhibition deserves attention: the influence of Greek and Roman art and Renaissance Classicism. The figures in most of the exhibition's prints have a full-bodied, naturalistic presence auguring an increasingly earthbound, humanistic tendency in European culture, which would further erode the worldly power of Christian institutions.

While some viewers may be fascinated by the scholarly issues and biblical themes that the exhibition so adroitly frames, the pictorial and narrative excitement will captivate many others. Among a series of dramatic scenes engraved by Philips Galle in 1565 is one showing soldiers tossing the accusers of Daniel into the lions' den, a rocky hole in the ground. The hyperactive choreography of writhing, half-naked men and ravenous beasts — vivified by the syncopating play of light and shadow and the Michelangeloesque draftsmanship — is almost comically horrifying.

The sexual aspect of Jesus, about which the art historian Leo Steinberg has written so eloquently, is everywhere in the show. In a colored engraving by Hans I Collaert, from around 1575-80, Jesus and the two thieves nailed and roped to their crosses look like Olympian gods or modern, steroid-enhanced athletes. Piety barely veils eroticism.

Female figures are in the minority here. In Goltzius's large, wonderfully luminous engravings of the Annunciation and the Holy Family, Mary is a vision of feminine sweetness. But under the aegis of patriarchal Christendom, women generally were suspect. One of a series of prints by Lucas, "The Small Power of Women" (1517), shows the seductress Jael hammering a tent spike into the head of the sleeping tyrant Sisera (From Judges 4:17-22). It is captioned with a quotation from Ecclesiasticus: "All evil is small in comparison to the evil of a woman."

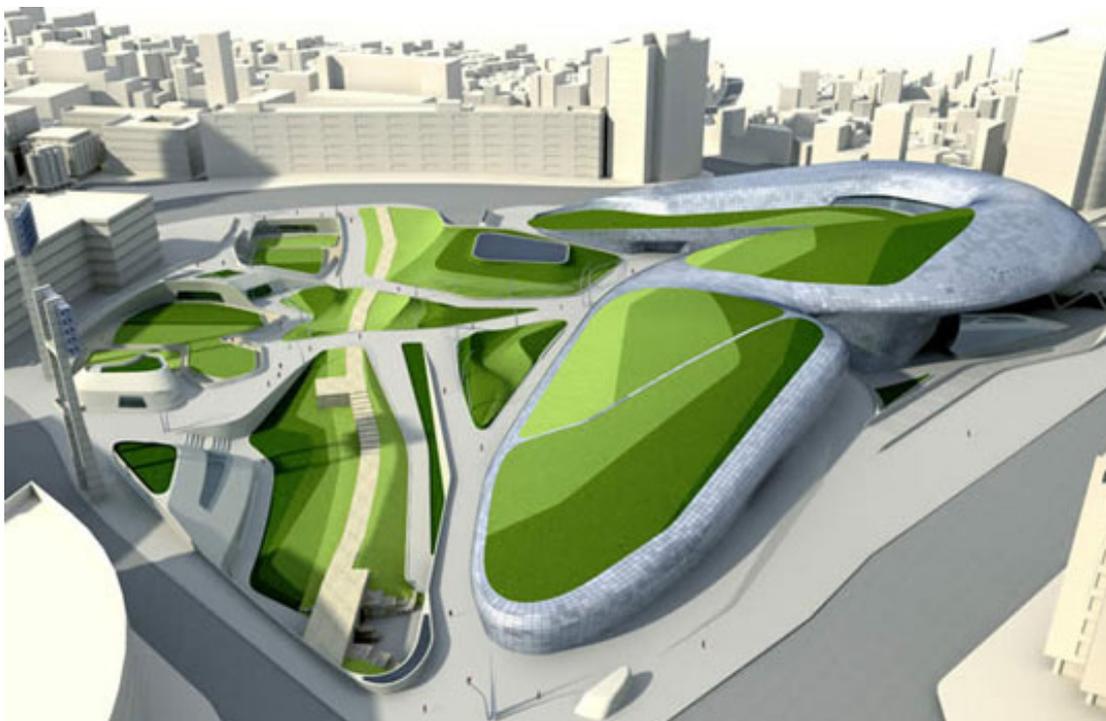
How far we have truly progressed from that sentiment is subject to debate. What remains undeniable, though, is the ability of Dutch printmakers to measure the heights and plumb the depths of the European soul.

<http://www.nytimes.com/2009/06/19/arts/design/19mobia.html?ref=design>

Zaha Hadid Lifts Seoul with Green-Roofed Dongdaemun Plaza

by Ginger Dolden

June 9, 2009



Situated within the urban depths of South Korea's largest shopping and business district, Dongdaemun Design Plaza & Park will provide shoppers, tourists and residents of Seoul with a place of leisure, relaxation and refuge when it opens in 2010. Designed by Pritzker Architecture Prize winning architect Zaha Hadid, the project infuses the city's dense urban center with an emerald core replete with rolling grass-covered roofs.

Hadid's plans for the 85,000 square meter plaza focus on the needs of the people in this highly populated and densely urbanized district. "A fundamental aim of the scheme is to bring delight and inspiration to the people of Seoul by establishing a cultural hub in the center of one of the busiest and most historic districts of the city," says Zaha Hadid. The plans for the center include a multi-purpose park, a design museum, a library, and other educational facilities.

The impressive 30,000 square meter park will both give homage to and re-interpret traditional Korean gardening design with reflecting pools, lotus ponds, pebble beds and bamboo grooves. Aside from providing an important green space in the city-center, the plaza will become a keystone between a historic district in the city and the rapidly growing contemporary culture. Dongdaemun Design Plaza & Park is located near an ancient city wall which will be a central element of the composition of the building.

Zaha Hadid and Patrik Schumacher joined the Mayor of Seoul, Sei-Hoon Oh, on April 28th for the groundbreaking ceremonies of the Dongdaemun Design Park & Plaza.

<http://www.inhabitat.com/2009/06/09/zaha-hadid-lifts-seoul-with-green-roofed-dongdaemun-plaza/>

British Library publishes online archive of 19th-century newspapers

- [Maev Kennedy](#)
- [The Guardian](#), Thursday 18 June 2009

Bad news is never new, but anyone overwhelmed by today's political scandals, wars, financial disasters, soaring unemployment and drunken feral children can take refuge in the 19th century – and its wars, financial disasters, political scandals, soaring unemployment and drunken feral children.

Over two million pages of 19th and early 20th century [newspapers](#) go online today, part of the vast [British Library](#) collection.

The 49 British national and regional titles cover events including the Battle of Waterloo in June 1815 – "Vague reports have been made of the numbers slain on both sides ... We should not quote them if our silence could prevent the spreading of disastrous intelligence", the Morning Chronicle reported. There was also the banks crisis of 1878, the first FA Cup final in 1872, and the triumph of the music hall star Vesta Tilley in a talent contest.

On 18 June 1859, the papers were reporting the political turmoil after the resignation of the Cabinet, as Palmerston struggled to put together a government in coalition with his former deadly rival Lord John Russell. As the Oxford Journal put it: "For the moment an event in our domestic politics eclipses in national interest the ever varying phases of the struggle in Italy." The Ipswich Journal reported passionate speeches in the House of Commons: "Their policy tended to ruin the people of England, and when they were turned out of office men slept more quietly in their beds. (Cries of "Oh! Oh!")"

Half a century earlier the news was no better. On June 18 1809 the Examiner warned of the alarming advances of the Emperor Napoleon against the Austrians, while its correspondent in Bohemia reported the confident prediction of Archduke Charles: "The days of the 21st and 22nd of May will be eternally memorable in the history of the world."

The shocking spectacle of drunken working men, women and even children was a recurring concern, but there was rare good news in 1840, when a correspondent to the Leeds Mercury reported the success of Father Mathew's temperance crusade in Dublin: "We still have abundance of poor, but our streets are not filled with the haggard and bloated faces they once were."

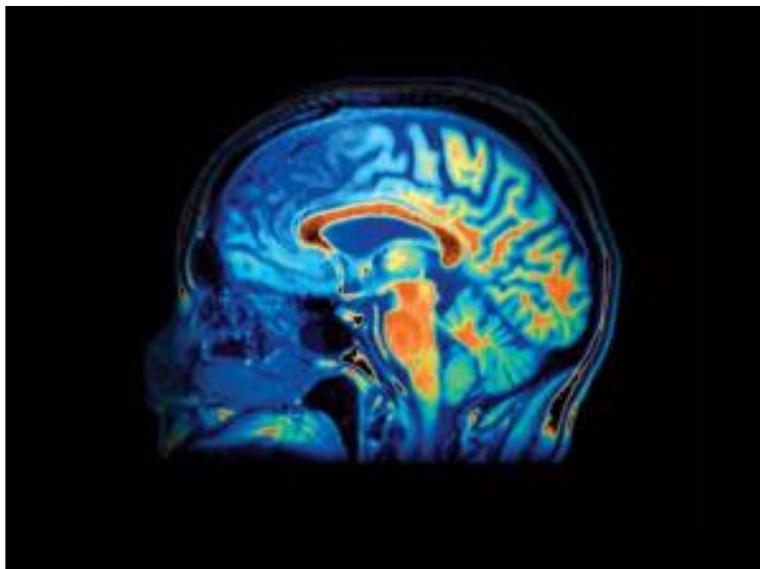
The site – <http://newspapers.bl.uk/blcs> – holds journals including the True Crime of its day, the Illustrated Police News which covered the Jack the Ripper murders. The British Library worked in partnership with the Joint Information Systems Committee and Gale, part of Cengage Learning, to create the service. Searches are free, but users can pay to download information.

<http://www.guardian.co.uk/media/2009/jun/18/british-library-newspaper-archive-online>

Like a hole in the head: The return of trepanation

- 17 June 2009 by [Arran Frood](#)

Magazine issue [2712](#).



A hole in the skull could increase blood flow to the brain (Image: Zephyr / SPL)

[Enlarge image](#)

[2 more images](#)

IN THE early 1960s, a young Russian neurophysiologist called Yuri Moskalkenko travelled from the Soviet Union to the UK on a Royal Society exchange programme. During his stay, he co-authored a paper published in *Nature*. "Variation in blood volume and oxygen availability in the human brain" may not sound subversive, but it was the start of a radical idea.

Decades later, having worked in Soviet Russia and become president of the Sechenov Institute of Evolutionary Physiology and Biochemistry at the Russian Academy of Sciences in St Petersburg, Moskalkenko is back in the UK. Now collaborating with researchers at the [Beckley Foundation in Oxford](#), his work is bearing fruit.

And strange fruit it is. With funding from the foundation, he is exploring the idea that people with Alzheimer's disease could be treated by drilling a hole in their skull. In fact, he is so convinced of the benefits of trepanation that he claims it may help anyone from their mid-40s onwards to slow or even reverse the process of age-related cognitive decline. Can he be serious?

For thousands of years, [trepanation has been performed for quasi-medical reasons such as releasing evil spirits that were believed to cause schizophrenia or migraine](#). Today it is used to prevent brain injury by relieving intracranial pressure, particularly after accidents involving head trauma.

In the popular imagination, though, it is considered crude, if not downright barbaric. Yet such is the desperation for effective treatments for dementia that drilling a hole in the skull is not even the strangest game in town (see "[Desperate measures to treat dementia](#)").

The problem is huge and growing. Alzheimer's, the most common form of dementia, affects 700,000 people in the UK and nearly 5 million in the US. In addition, 1 in 5 Americans over the age of 75 have mild cognitive impairment, which often leads to Alzheimer's. As people live longer, the numbers seem certain to grow. Yet we have few ideas about what causes dementia and even fewer about how

to treat it. Most patients get a mixture of drugs and occupational therapy, which at best stalls the apparent progression of their illness by masking its symptoms.

The causes of dementia are many and poorly understood, but there is growing evidence that one factor is the flow of blood within the brain. As we age, cerebral blood flow decreases, and the earlier this happens the more likely someone is to develop early onset dementia. It remains unclear, however, whether declining cerebral blood flow is the cause, or an incidental effect of a more fundamental change. Moskalkenko's research indicates that cerebral blood flow is more closely correlated with age than with levels of dementia, so he decided to delve more deeply.

The brain's buffer

As well as delivering oxygen to the brain, cerebral blood flow has another vital role: the circulation and production of cerebrospinal fluid. This clear liquid surrounds the brain, carrying the nutrients that feed it and removing the waste it produces, including the tau and beta-amyloid proteins that have been implicated in the formation of plaques found in the brains of people with Alzheimer's (*Cerebrospinal Fluid Research*, vol 5, p 10).

How blood flow influences cerebrospinal fluid flow can be gauged from something called "cranial compliance", a measure of the elasticity of the brain's vascular system. "The cranium is a bony cavity of fixed volume, with the brain taking up most of the space," says Robin Kennett, a neurophysiologist from the Oxford Radcliffe Hospitals in the UK. "Every time the heart beats and sends blood into the cranium, something else has to come out to prevent the pressure rising to levels that would damage the brain." So, as fresh blood flows into the brain's blood vessels, cerebrospinal fluid flows out into the space around the spinal cord through a hole in the base of the skull called the foramen magnum.

As we age, the proteins in the brain harden, preventing this system from working as it should. As a result, the flow of both blood and cerebrospinal fluid is reduced, impairing the delivery of oxygen and nutrients as well as the removal of waste. Moskalkenko's research suggests that this normally begins between the ages of 40 and 50. Moreover, in a study of 42 elderly people with dementia, he found that the severity of their cognitive disorder was strongly correlated with cranial compliance: those with the severest dementia had the lowest compliance (*International Journal of Psychophysiology*, vol 69, p 307). "Cranial compliance is a significant component of the origin of certain cases of brain pathology," he says.

This view gets qualified agreement from Conrad Johanson, a clinical neuroscientist at Brown University in Providence, Rhode Island. Although the link between low compliance and dementia has yet to be comprehensively shown, he says, "there's a gestalt that it's broadly true".

So where does trepanation come into all this? "A hole made in the bony cavity would act as a pressure-release valve," says Kennett, and this would alter the flow of fluids around the brain. This is exactly what Moskalkenko observed when he carried out one of the first neurophysiological studies on trepanation.

Moskalkenko studied 15 people who had undergone the procedure following head injuries. He found that their cranial compliance was around 20 per cent higher than the average for their age. Based on this, he calculates that a 4-square-centimetre hole increases cerebral blood flow by between 8 and 10 per cent, which is equivalent to 0.8 millilitres more blood per heartbeat (*Human Physiology*, vol 34, p 299). This, he says, shows that trepanation could be an effective treatment for Alzheimer's, and he even goes so far as to suggest that it might provide a "significant" improvement in the mental functions of anyone from their mid-40s, when cranial compliance starts to decline.

A 4-square-centimetre hole increases cerebral blood flow by between 8 and 10 per cent

Spinal taps

Surprisingly, his most vociferous critics do not challenge his support for trepanation. Instead they question his ideas about how it works. Gerald Silverberg at the Stanford School of Medicine in California points out that drilling a hole in the skull may temporarily drain the cranial cavity of cerebrospinal fluid together with any toxins that may have accumulated in it, effectively flushing out the system. "Metabolite clearance, or the lack of it, is felt to be an important factor in the development of age-related dementias," he says. A similar intervention, known as a lumbar shunt or "spinal tap", in which a needle is inserted into the spinal column to remove cerebrospinal fluid, can dramatically improve the cognitive performance of people who undergo the procedure, Silverberg says. Spinal taps are normally used as a treatment for hydrocephalus - water on the brain - but Silverberg is now trying it out on people with Alzheimer's, and early studies suggest it helps (*Neurology*, vol 59, p 1139).

Olivier Baledent, a neurophysiologist based at the University Hospital of Amiens, France, also questions Moskalkenko's focus on cranial compliance (*Journal of Cerebral Blood Flow & Metabolism*, vol 27, p 1563). Like Silverberg, he believes cerebrospinal fluid itself is key. Baledent's unpublished research shows that in people with mild cognitive impairment, there is reduced activity in a part of the brain called the choroid plexus, where cerebrospinal fluid is formed. He suspects this results in impaired fluid formation and reabsorption, leading to a build-up of toxins, and that a spinal tap may be able to stop or decrease dementia by improving fluid turnover. Trepanation could work in a similar way.

So will dementia patients and their families ever accept trepanation as a treatment for the condition? Johanson, who sees trepanation as no more alarming than a spinal tap, admits that it is always going to be a hard sell. "People think it's witchcraft when you drill a hole in the skull and patients are improving."

It is always going to be a hard sell - people think it's witchcraft when you drill a hole in the skull and patients start improving

Harriet Millward, deputy chief executive of UK-based charity Alzheimer's Research Trust, is keeping an open mind. "The procedure has been understudied so far and, until further research has been undertaken, the possibility of beneficial effects remains open," she says. David Smith, a neuropharmacologist and head of the Oxford Project to Investigate Memory and Ageing, is even more receptive. "I think the observations look pretty robust," he says. In the absence of drug treatments for dementia, "these rather drastic surgical ones are worth considering", he says

<http://www.newscientist.com/article/mg20227121.400-like-a-hole-in-the-head-the-return-of-trepanation.html?full=true&print=true>

Polar Bear And Walrus Populations In Trouble, Stock Assessment Report Suggests



Herd of walrus on an ice floe in the Arctic. (Credit: iStockphoto/John Pitcher)

ScienceDaily (June 19, 2009) — The U.S. Fish and Wildlife Service has released reports documenting the status of polar bears and Pacific walrus in Alaska. The reports confirm that polar bears in Alaska are declining and that Pacific walrus are under threat. Both species are imperiled due to the loss of their sea-ice habitat due to global warming, oil and gas development, and unsustainable harvest.

“Polar bears and walrus are under severe threat, and unless we act rapidly to reduce greenhouse pollution and protect their habitat from oil development, we stand to lose both of these icons of the Arctic,” said Brendan Cumming, oceans program director at the Center for Biological Diversity.

The reports, issued pursuant to the Marine Mammal Protection Act, summarize information on population abundance and trends of polar bears and walrus, threats to the species, and include calculations of human-caused mortality and whether that mortality is sustainable.

There are two polar bear populations in Alaska: a Southern Beaufort Sea stock, which is shared with Canada, and a Chukchi/Bering Sea stock which is shared with Russia. The Pacific walrus occurs in the Bering and Chukchi seas and is shared with Russia.

For the Southern Beaufort Sea polar bear stock, the Fish and Wildlife Service estimated a minimum population of 1,397 bears and an annual human-caused mortality of 54 animals, well above the calculated sustainable rate of 22 animals per year. The stock assessment states that “the Southern Beaufort Sea population is now declining.”

For the Chukchi/Bering Sea polar bear stock, the Service estimated a minimum population of 2,000 bears and an annual human-caused mortality of 37 animals from Alaska and between 150-250 bears killed per year in Russia. The calculated sustainable rate of harvest is 30 animals per year. The stock assessment states that “the population is believed to be declining” and is “reduced based on harvest levels that were demonstrated to be unsustainable.”

For the Pacific walrus, the Service estimated a minimum population of 15,164 animals and an annual human-caused mortality of between 4,963 and 5,460 animals. The calculated sustainable rate of harvest is 607 animals per year.

Of the three population estimates, only the estimate for the well-studied Beaufort Sea polar bears is considered reliable. The Chukchi/Bering Sea polar bear population is based on incomplete data and could be an overestimate, while the walrus estimate is an underestimate as it only represents surveys in about half of the walrus habitat and does not account for walrus not counted because they were in the water rather than hauled out on ice.

“These reports publicly confirm what scientists have known for several years: Polar bear and walrus populations in Alaska are in trouble,” added Cummings. “And even if the population numbers are not precise, we know that without their sea-ice habitat they are likely doomed.”

The Marine Mammal Protection Act requires that the secretary of the interior and the secretary of commerce prepare stock assessments for marine mammals. The assessments are meant to be used as the basis for management decisions such as permitting the killing or harassment of the animals from commercial fisheries, oil and gas exploration, boating and shipping, and military exercises.

To ensure that decision-makers have the most accurate information, stock assessments are supposed to be revised every year for endangered marine mammals and every three years for other species. While the National Marine Fisheries Service – the agency responsible for whales, dolphins, and seals – has largely complied with this requirement, the Fish and Wildlife Service, responsible for polar bears, walrus, sea otters, and manatees, had completely ignored it.

In 2007 the Center sued the Wildlife Service and obtained a court order requiring the release of updated reports. Stock assessments for the Florida manatee were released last week, while sea otter reports were issued last year.

The polar bear is currently listed as threatened under the Endangered Species Act as a result of a petition and litigation by the Center for Biological Diversity. The Fish and Wildlife Service is under court order to make a finding on the Center’s petition to protect the Pacific walrus under the Endangered Species Act by September 10, 2009.

A copy of the stock assessments released June 18 can be found at <http://alaska.fws.gov/fisheries/mmm/reports.htm>

Adapted from materials provided by [Center for Biological Diversity](#).

<http://www.sciencedaily.com/releases/2009/06/090618195804.htm>

Astronomer Champions The Study Of Solar Eclipses In The Modern Era



This week's issue of Nature features solar eclipse research -- and an image of an eclipse -- on its cover. (Credit: Nature)

ScienceDaily (June 19, 2009) — Championing the modern-day use of solar eclipses to solve a set of modern problems is the goal of a review article written by Jay Pasachoff, visiting associate at the California Institute of Technology (Caltech) and Field Memorial Professor of Astronomy at Williams College. The review is the cover story of the June 11 issue of *Nature*, as part of its coverage of the International Year of Astronomy.

Pasachoff's review article describes the history of eclipse discoveries, as well as current themes in eclipse research. "In the article, I try to show how there is still a vital role for eclipses in the range of observations we want to make of the sun," he says.

While space-based telescopes provide "wonderful" data for astronomers to examine, there are still observations that are "inaccessible from space," Pasachoff points out. "[I]t appears that for decades ground-based capabilities will still allow unique observations to be made from Earth rather than from space," he writes in his review.

Indeed, viewing an eclipse from the ground provides "the flexibility to use the latest equipment and to take advantage of new theoretical ideas to frame observations," he notes.

Despite the novelty of these approaches, Pasachoff says, "Many people still have an old-fashioned view of eclipses going back to the discovery of helium or the use of the eclipse 90 years ago this month for verifying Einstein's general theory of relativity. But those are old problems. These days there are a whole series of new questions and new methods that we can apply at eclipses."

Scientists will get their chance to ask those questions and use those methods next month, Pasachoff says, during what will be the longest solar eclipse in the 21st century. The upcoming total eclipse—which will be visible in China and India on July 22 for almost six minutes, "an unusually long time for a totality"—will allow Pasachoff's team, as well as many other teams of scientists, to make important observations that are expected to advance our understanding of the solar atmosphere.

Pasachoff will view the eclipse—his 49th such event—from a 3,000-foot-high mountain in Tianhuangping, China, along with a group of colleagues and students from Williams College. There, he will gather data to continue his research into the heating of the solar corona, which has a temperature of millions of degrees. "We'll be looking for waves in the corona," he says, "for vibrations in the corona that are a sign of these particular waves in the magnetic field that are heating the corona."

The study of eclipses, Pasachoff says, has been enhanced by advances in computer imaging that make it possible to "bring out" low-contrast features. Just such an image—computer-processed by Pasachoff's colleague, Miloslav Druckmüller of the Brno University in the Czech Republic—was chosen by Nature for the cover of the issue containing Pasachoff's review article.

For these and many other reasons, Pasachoff says, the ground-based study of solar eclipses will continue to provide insights and observations of the sun that would otherwise be unobtainable. As he notes in his Nature review article, "At present the paired science and beauty of solar eclipses remain uniquely available to scientists and others in the path of totality."

Pasachoff's expedition to China will be supported by the National Geographic Society. His eclipse research has been supported by the Committee for Research and Exploration of the National Geographic Society, the National Science Foundation, NASA, and Williams College. NASA's Planetary Sciences Division has also provided the electronic cameras that Pasachoff's team uses both in his eclipse studies and in his studies of Pluto and other outer-solar-system objects, in which he has collaborated with Mike Brown, Caltech's Richard and Barbara Rosenberg Professor and professor of planetary astronomy.

Journal reference:

1. Jay M. Pasachoff. **Solar eclipses as an astrophysical laboratory**. *Nature*, 2009; DOI: [10.1038/nature07987](https://doi.org/10.1038/nature07987)

Adapted from materials provided by [California Institute of Technology](http://www.caltech.edu), via [EurekAlert!](http://www.eurekalert.org), a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090610133459.htm>

Donor Stem Cell Transplantation Associated With Survival Benefit For Patients With Leukemia

ScienceDaily (June 19, 2009) — An analysis of previous studies indicates that allogeneic stem cell transplantation (SCT) (stem cells from a compatible donor) is associated with significant overall and relapse-free survival benefit among adult patients with intermediate- and poor-risk but not good-risk acute myeloid leukemia in first complete remission, compared with nonallogeneic SCT therapies, according to a new article.

The optimal curative treatment of acute myeloid leukemia (AML) in first complete remission (CR1) is uncertain. While more than 70 percent of younger adult patients with newly diagnosed AML will enter a CR1 after initial (induction) chemotherapy, a substantial number subsequently experience disease relapse, according to background information in the article. "Allogeneic SCT after myeloablative conditioning [high-dose radiation and/or chemotherapy given to destroy normal and cancerous cells in the bone marrow prior to infusion of donor stem cells] is a curative treatment option for younger patients with AML in CR1. However, concerns regarding allogeneic SCT-related toxicity, and questions regarding its benefit, limit its use for patients who have attained an initial remission," the authors write.

John Koreth, M.B.B.S., D.Phil., of the Dana Farber Cancer Institute, Boston, and colleagues conducted a meta-analysis to quantify relapse-free survival (RFS) and overall survival benefit of allogeneic SCT for AML in CR1 overall, and also for good-, intermediate-, and poor-risk AML. The researchers conducted a search for articles on trials evaluating allogeneic SCT vs. nonallogeneic SCT therapies (autologous [donor and recipient are the same person] SCT, consolidation chemotherapy, or both) for AML in CR1. The researchers identified 24 trials that met criteria for inclusion in the analysis, which included 6,007 patients (5,951 patients in RFS analyses and 5,606 patients in overall survival analyses); 3,638 patients were analyzed by cytogenetic (abnormalities in the composition of the chromosomes) risk (547, 2,499, and 592 with good-, intermediate-, and poor-risk AML, respectively).

"Our primary finding is that the totality of the prospective trial data indicates statistically significant RFS and overall survival benefit with allogeneic SCT for adult AML in CR1. This conclusion is supported by a variety of sensitivity and subgroup analyses ... Additionally, our analyses indicate that allogeneic SCT benefit likely varies by AML cytogenetic risk. We document significant RFS and overall survival benefit for allogeneic SCT in intermediate- and poor-risk AML, and a lack of significant RFS or overall survival benefit for good-risk AML," the authors write.

"While enrollment in therapeutic trials is to be encouraged, our findings provide evidence to guide clinical decision making and future trial design."

Journal reference:

1. John Koreth; Richard Schlenk; Kenneth J. Kopecky; Sumihisa Honda; Jorge Sierra; Benjamin J. Djulbegovic; Martha Wadleigh; Daniel J. DeAngelo; Richard M. Stone; Hisashi Sakamaki; Frederick R. Appelbaum; Hartmut Dohner; Joseph H. Antin; Robert J. Soiffer; Corey Cutler. **Allogeneic Stem Cell Transplantation for Acute Myeloid Leukemia in First Complete Remission Systematic Review and Meta-analysis of Prospective Clinical Trials.** *JAMA*2009;301(22):2349-2361, [[link](#)]

Adapted from materials provided by JAMA and Archives Journals.

<http://www.sciencedaily.com/releases/2009/06/090609215941.htm>

Natural Computing And Synthetic Biology Techniques Advanced For Treating Diseases

ScienceDaily (June 19, 2009) — Researchers from the Artificial Intelligence Group (LIA) at the Universidad Politécnica de Madrid's School of Computing have designed a biomolecular automaton and several genetic circuits with potential future applications in the field of vanguard medicine.

Depending on how it is programmed, the molecular automaton detects DNA or RNA signals in vitro. In the future, though, provided it passes all the experimental tests, it will be able to operate inside the human organism.

The ultimate aim of a molecular automaton is to detect and treat diseases in situ inside a human organism. Fitted inside the organism, the automaton detects anomalies and dispenses the right medicine at the right time. Biomolecular automata are artificial devices built with biomolecules and designed to operate inside a living organism.

These automata are engineered by first drafting a pencil-and-paper design or specification. Then a mathematical model is built describing the equations governing its operation. This is followed by a computer simulation. Finally, the automaton is implemented in a biotechnology laboratory. The whole process will be repeated cyclically until the automaton has the desired features and functionality.

The design and application of programmable molecular automata to the diagnosis and in vivo treatment of diseases (also known as intelligent drug) is a recent and promising application of DNA computing to biomedicine, which was initiated by Prof. Yaakov Benenson in 2004.

The new biomolecular automaton designed and modelled at the UPM's School of Computing has been sent to the Technische Universität München's nanobiotechnology laboratory for implementation and, if it works, will be applied to medical research.

Genetic oscillators

The LIA has also designed several circuits or synthetic biological oscillators, whose job is to synchronize the activity of biomolecular automata in a living system.

One of the synthetic biomolecular circuit designs developed by this group is to be presented at the 3rd International Workshop on Practical Applications of Computational Biology & Bioinformatics (IWPACBB'09) to be held in Salamanca (Spain) this week.

The synthetic genetic circuit to be presented at Salamanca outputs a biological signal. The signal concentration alternates at regular time intervals and can be used as a clock signal for synchronizing biological processes. The clock signal frequency of this oscillating circuit can be modified (faster or slower clock), and it will act on a biological circuit in the same way as the clock signal in digital computers.

This design will also be implemented at the Technische Universität München and, if it works properly, will be donated to the Registry of Standard Biological Parts, the open source genetic circuits design database maintained by the Biobricks Foundation, associated with MIT.

This circuit or genetic oscillator is to be used as a module for synchronizing the activity of other modules of a more complex genetic circuit or as a synchronization signal controlling the activity and the operating rate of a set of biomolecular automata. These oscillating circuits are like traffic lights deployed inside a cell or a bacteria that control and regulate the operation of the other circuits or biomolecular automata.

Cutting-Edge Research



The aim of this project, which kicked off in 2006 and is to wind up at the end of 2009, is to advance natural computing and systems biology using a cell-inspired distributed computing model (called P system or membrane computing), as well as to develop synthetic biology by designing new circuits and biomolecular automata.

As a branch of science, natural computing has two goals: understand the computational processes taking place in nature (particularly, biology) and develop computational models inspired by nature. Systems biology pursues the challenge of developing robust and precise mathematical models whose application can describe, understand and make predictions on complex biological systems and processes. The budding discipline of synthetic biology aims to design and build new devices and artificial biological organisms, as well as redesign and reprogram natural biological systems.

This project, led by School of Computer professor Alfonso Rodríguez-Patón and researched by doctoral candidate Jesús Miró Bueno, has been funded by the Spanish Ministry of Education and Science (Project TIN2006-15595).

Adapted from materials provided by Facultad de Informática de la Universidad Politécnica de Madrid, via AlphaGalileo.

<http://www.sciencedaily.com/releases/2009/06/090610161002.htm>



Fibromyalgia Patients Show Decreases In Gray Matter Intensity

ScienceDaily (June 18, 2009) — Previous studies have shown that fibromyalgia is associated with reductions in gray matter in parts of the brain, but the exact cause is not known. Using sophisticated brain imaging techniques, researchers from Louisiana State University, writing in *The Journal of Pain*, found that alterations in levels of the neurotransmitter dopamine might be responsible for gray matter reductions.

For the study, magnetic imaging resonance data from 30 female fibromyalgia patients were compared with 20 healthy women of the same age. The primary objective of the study was to confirm original findings about reduced gray matter density in a larger sample of fibromyalgia patients. They explored whether there is a correlation between dopamine metabolic activity and variations in the density of gray matter in specific brain regions.

Results showed there were significant gray matter reductions in the fibromyalgia patients, which supports previous research. In addition, the fibromyalgia patients showed a strong correlation of dopamine metabolism levels and gray matter density in parts of the brain in which dopamine controls neurological activity.

The authors concluded that the connection between dopamine levels and gray matter density provide novel insights to a possible mechanism that explains some of the abnormal brain morphology associated with fibromyalgia.

Adapted from materials provided by American Pain Society

<http://www.sciencedaily.com/releases/2009/06/090616190258.htm>



Mammoths Survived In Britain Until 14,000 Years Ago, New Discovery Suggests



Artist's concept of a woolly mammoth family. (Credit: iStockphoto/KIM FREITAS)

ScienceDaily (June 18, 2009) — Research which finally proves that bones found in Shropshire, England provide the most geologically recent evidence of woolly mammoths in North Western Europe publishes June 17 in the *Geological Journal*. Analysis of both the bones and the surrounding environment suggests that some mammoths remained part of British wildlife long after they are conventionally believed to have become extinct.

The mammoth bones, consisting of one largely complete adult male and at least four juveniles, were first excavated in 1986, but the carbon dating which took place at the time has since been considered inaccurate. Technological advances during the past two decades now allow a more exact reading, which complements the geological data needed to place the bones into their environmental context. This included a study of the bones' decay, analysis of fossilised insects which were also found on the site, and a geological analysis of the surrounding sediment.

The research was carried out by Professor Adrian Lister, based at the Natural History Museum in London, who has conducted numerous studies into 'extinction lag' where small pockets of a species have survived for thousands of years longer than conventionally thought.

"Mammoths are conventionally believed to have become extinct in North Western Europe about 21,000 years ago during the main ice advance, known as the 'Last Glacial Maximum'" said Lister. "Our new radiocarbon dating of the Conover mammoths changes that, by showing that mammoths returned to Britain and survived until around 14,000 years ago."

As the Shropshire bones are the latest record of mammoths in North Western Europe they not only prove that the species survived for much longer than traditionally believed it also provides strong evidence to settle the debate as to whether mammoth extinction was caused by climate change or human hunting.

"The new dates of the mammoths' last appearance correlate very closely in time to climate changes when the open grassy habitat of the Ice Age was taken over by advancing forests, which provides a likely explanation for their disappearance," said Lister. "There were humans around during the time of the Condoover mammoths, but no evidence of significant mammoth hunting."

Dr Lister's findings feature in one of three papers on the Condoover Mammoths which are all published in the *Geological Journal*. The other papers focus on the Palaeoenvironmental context of the mammoths (Allen et al) and a geological study of the site in which the mammoths were discovered (Scourse et al).

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Adapted from materials provided by *Wiley-Blackwell*, via *EurekAlert!*, a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090617201758.htm>

Some Video Games Can Make Children Kinder And More Likely To Help



Some video games can make children kinder and more likely to help—not hurt—other people. (Credit: iStockphoto/Scott Dunlap)

ScienceDaily (June 18, 2009) — Some video games can make children kinder and more likely to help—not hurt—other people.

That's the conclusion of new research published in the June 2009 issue of *Personality and Social Psychology Bulletin*.

The article presents the findings of three separate studies, conducted in different countries with different age groups, and using different scientific approaches. All the studies find that playing games with prosocial content causes players to be more helpful to others after the game is over.

The report is co-authored by a consortium of researchers from the United States, Japan, Singapore and Malaysia.

"Dozens of studies have documented a relationship between violent video games and aggressive behaviors," said lead author Douglas Gentile, an Iowa State University psychologist. "But this is one of the first that has documented the positive effects of playing prosocial games."

Prosocial video games involve characters who help and support each other in nonviolent ways.

"These studies show the same kind of impact on three different age groups from three very different cultures," said Brad Bushman, a University of Michigan co-author of the report. "In addition, the studies use different analytic approaches—correlational, longitudinal and experimental. The resulting triangulation of evidence provides the strongest possible proof that the findings are both valid and generalizable."

"These studies document that children and adolescents learn from practicing behaviors in games," said Rowell Huesmann, a U-M co-author of the report.

One study examined the link between video game habits and prosocial behavior among 727 secondary students in Singapore, with a mean age of 13. Students listed their favorite games and rated how often game characters helped, hurt or killed other characters. They also answered questions about how likely they were to spend time and money helping people in need, to cooperate with others and share their belongings, and to react aggressively in various situations.

As in numerous other studies, the researchers found a strong correlation between playing violent video games and hurting others. But the study also found a strong correlation between playing prosocial games and helping others.

The second study analyzed the long-term connection between video game habits and prosocial behavior in nearly 2,000 Japanese children ages 10 to 16. Participants completed a survey about their exposure to prosocial video games, and rated how often they had helped other people in the last month. Three to four months later, they were surveyed again, and researchers found a significant connection between exposure to prosocial games and helpful behavior months later.

"This suggests there is an upward spiral of prosocial gaming and helpful behavior, in contrast to the downward spiral that occurs with violent video gaming and aggressive behavior," said Bushman, a professor of communications and psychology and a research professor at the U-M Institute for Social Research (ISR).

For the third study, the researchers carried out an experiment with 161 U.S. college students, with a mean age of 19. After playing either a prosocial, violent, or neutral game, participants were asked to assign puzzles to a randomly selected partner. They could choose from puzzles that were easy, medium or hard to complete. Their partner could win \$10 if they solved all the puzzles. Those who played a prosocial game were considerably more helpful than others, assigning more easy puzzles to their partners. And those who had played violent games were significantly more likely to assign the hardest puzzles.

"Taken together, these findings make it clear that playing video games is not in itself good or bad for children," Bushman said. "The type of content in the game has a bigger impact than the overall amount of time spent playing."

Adapted from materials provided by [University of Michigan](http://www.umich.edu).

<http://www.sciencedaily.com/releases/2009/06/090617171819.htm>

Humans More Related To Orangutans Than Chimps, Study Suggests



New evidence underscores the theory of human origin that suggests humans most likely share a common ancestor with orangutans. (Credit: iStockphoto/Derek Dammann)

ScienceDaily (June 18, 2009) — New evidence underscores the theory of human origin that suggests humans most likely share a common ancestor with orangutans, according to research from the University of Pittsburgh and the Buffalo Museum of Science. Reporting in the June 18 edition of the *Journal of Biogeography*, the researchers reject as "problematic" the popular suggestion, based on DNA analysis, that humans are most closely related to chimpanzees, which they maintain is not supported by fossil evidence.

Jeffrey H. Schwartz, professor of anthropology in Pitt's School of Arts and Sciences and president of the World Academy of Art and Science, and John Grehan, director of science at the Buffalo Museum, conducted a detailed analysis of the physical features of living and fossil apes that suggested humans, orangutans, and early apes belong to a group separate from chimpanzees and gorillas. They then constructed a scenario for how the human-orangutan common ancestor migrated between Southeast Asia—where modern orangutans are from—and other parts of the world and evolved into now-extinct apes and early humans. The study provides further evidence of the human-orangutan connection that Schwartz first proposed in his book "The Red Ape: Orangutans and Human Origins, Revised and Updated" (Westview Press, 2005).

Schwartz and Grehan scrutinized the hundreds of physical characteristics often cited as evidence of evolutionary relationships among humans and other great apes—chimps, gorillas, and orangutans—and selected 63 that could be verified as unique within this group (i.e., they do not appear in other primates). Of these features, the analysis found that humans shared 28 unique physical characteristics with orangutans, compared to only two features with chimpanzees, seven with gorillas, and seven with all three apes (chimpanzees, gorillas, and orangutans). Gorillas and chimpanzees shared 11 unique characteristics.

Schwartz and Grehan then examined 56 features uniquely shared among modern humans, fossil hominids—ancestral humans such as *Australopithecus*—and fossil apes. They found that orangutans shared eight features with early humans and *Australopithecus* and seven with *Australopithecus* alone. The occurrence of orangutan features in *Australopithecus* contradicts the expectation generated by DNA analysis that ancestral humans should have chimpanzee similarities, Schwartz and Grehan write. Chimpanzees and gorillas were found to share only those features found in all great apes.

Schwartz and Grehan pooled humans, orangutans, and the fossil apes into a new group called "dental hominoids," named for their similarly thick-enameled teeth. They labeled chimpanzees and gorillas as African apes and wrote in *Biogeography* that although they are a sister group of dental hominoids, "the

African apes are not only less closely related to humans than are orangutans, but also less closely related to humans than are many" fossil apes.

The researchers acknowledge, however, that early human and ape fossils are largely found in Africa, whereas modern orangutans are found in Southeast Asia. To account for the separation, they propose that the last common human-orangutan ancestor migrated between Africa, Europe, and Asia at some point that ended at least 12 million to 13 million years ago. Plant fossils suggest that forests once extended from southern Europe, through Central Asia, and into China prior to the formation of the Himalayas, Schwartz and Grehan write, proposing that the ancestral dental hominoid lived and roamed throughout this vast area; as the Earth's surface and local ecosystems changed, descendant dental hominoids became geographically isolated from one another.

Schwartz and Grehan compare this theory of ancestral distribution with one designed to accommodate a presumed human-chimpanzee relationship. They write that in the absence of African ape fossils more than 500,000 years old, a series of "complicated and convoluted" scenarios were invented to suggest that African apes had descended from earlier apes that migrated from Africa to Europe. According to these scenarios, European apes then diverged into apes that moved on to Asia and into apes that returned to Africa to later become humans and modern apes. Schwartz and Grehan challenge these theories as incompatible with the morphological and biogeographic evidence.

Paleoanthropologist Peter Andrews, a past head of Human Origins at the London Natural History Museum and coauthor of "The Complete World of Human Evolution" (Thames & Hudson, 2005), said that Schwartz and Grehan provide good evidence to support their theory. Andrews had no part in the research, but is familiar with it. "They have good morphological evidence in support of their interpretation, so that it must be taken seriously, and if it reopens the debate between molecular biologists and morphologists, so much the better," Andrews said. "They are going against accepted interpretations of human and ape relationships, and there's no doubt their conclusions will be challenged. But I hope it will be done in a constructive way, for science progresses by asking questions and testing results."

Schwartz and Grehan contend in the *Journal of Biogeography* that the clear physical similarities between humans and orangutans have long been overshadowed by molecular analyses that link humans to chimpanzees, but that those molecular comparisons are often flawed: There is no theory holding that molecular similarity necessarily implies an evolutionary relationship; molecular studies often exclude orangutans and focus on a limited selection of primates without an adequate "outgroup" for comparison; and molecular data that contradict the idea that genetic similarity denotes relation are often dismissed.

"They criticize molecular data where criticism is due," said Malte Ebach, a researcher at Arizona State University's International Institute for Species Exploration who also was not involved in the project but is familiar with it. "Palaeoanthropology is based solely on morphology, and there is no scientific justification to favor DNA over morphological data. Yet the human-chimp relationship, generated by molecular data, has been accepted without any scrutiny. Grehan and Schwartz are not just suggesting an orangutan-human relationship—they're reaffirming an established scientific practice of questioning data."

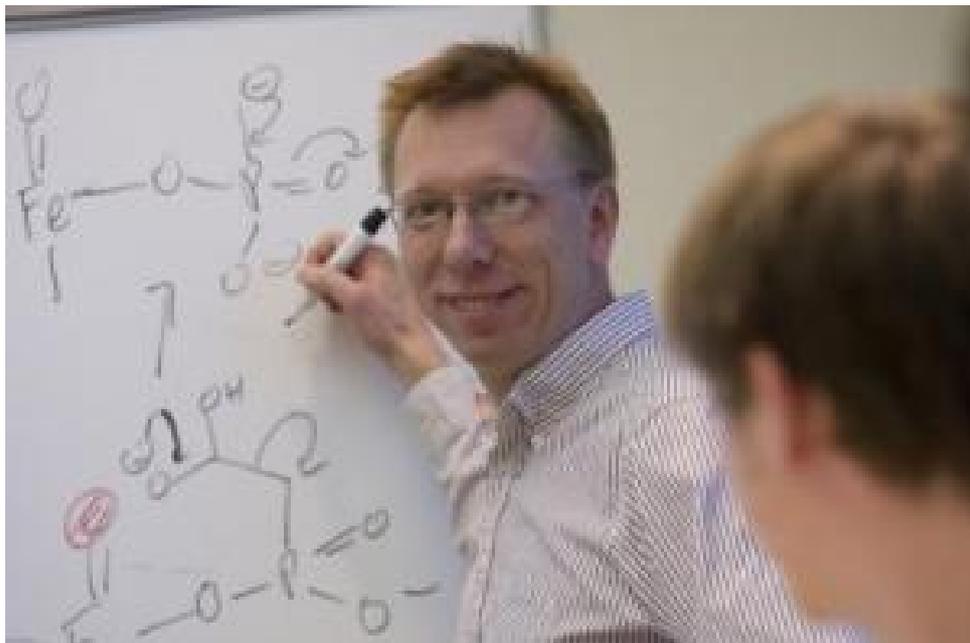
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Adapted from materials provided by [University of Pittsburgh](http://www.universityofpittsburgh.edu).

<http://www.sciencedaily.com/releases/2009/06/090618084304.htm>

'Implausible' Chemistry Produces Herbicidal Compound



A study by chemistry professor Wilfred van der Donk and his colleagues describes the unusual mechanism by which a newly described enzyme breaks a non-activated carbon-carbon bond in a single step. (Credit: Photo by Bill Hamerman)

ScienceDaily (June 18, 2009) — A soil microbe that uses chemical warfare to fight off competitors employs an unusual chemical pathway in the manufacture of its arsenal, researchers report, making use of an enzyme that can do what no other enzyme is known to do: break a non-activated carbon-carbon bond in a single step.

Their study, appearing this week in the journal *Nature*, provides the first three-dimensional structure of the enzyme, hydroxyethylphosphonate dioxygenase (HEPD) and proposes a mechanism by which it performs its task.

University of Illinois researchers first reported the enzyme in *Nature Chemical Biology* in 2007, said Wilfred van der Donk, an author on both papers with microbiologist William Metcalf.

"Our team discovered this very implausible chemical reaction," van der Donk said. "And the more we learned about it the more unusual it became. The enzyme is unusual because it breaks a carbon-carbon bond without needing anything except oxygen."

The study is important because HEPD catalyzes a critical step in the chemical pathway that produces phosphinothricin (PT), a bacterial compound that is widely used as an agricultural herbicide. This compound, which is a component of two top-selling weed killers (Liberty and Basta), is effective when used with transgenic crops that have a PT-resistance gene inserted into their DNA. The resistance gene also comes from the bacteria that produce PT. It allows the bacteria (which belong to the genus *Streptomyces*) to emit the antibiotic to kill off their competitors without killing themselves. Similarly, corn and other crops that contain the resistance gene are able to withstand PT-based herbicides that kill the weeds around them.

The new findings are part of an ongoing exploration at Illinois of naturally produced molecules that contain carbon-phosphorus (C-P) bonds. Although little understood, these phosphonates (which contain C-P bonds) and phosphinates (with C-P-C bonds) are already widely used in agriculture and medicine.



This class of compounds includes the herbicide glyphosate, the osteoporosis treatment alendronate, the antimalarial drug fosmidomycin and the antibiotics fosfomycin, dehydrophos and plumbemycin.

Whether man-made or naturally produced, phosphonates and phosphinates are structurally similar to other compounds used by enzymes in nature. They sometimes bind to the same enzymes and thus can inhibit ordinary cellular processes in bacteria or other organisms. This makes them attractive candidates for the development of new antibiotics, said van der Donk, a principal investigator on the study with Metcalf and biochemistry professor Satish Nair.

Understanding how bacteria synthesize these compounds also enables the scientists to predict how bacteria might develop resistance to any new drugs that are developed, he said.

"Knowing how a compound is made may allow you to make an analog that can overcome that resistance," van der Donk said. "That's the game that's been played with penicillin for the last 40 years. Every time a bacterial strain becomes resistant to one penicillin, scientists tinker with the structure so that the organism is susceptible again."

The researchers hope the new findings will spur the development of much smaller, cheaper and more efficient synthetic catalysts that can also sever C-C bonds in one step.

"Every time we find something new in nature it's an inspiration to see if we can copy that reactivity with a small molecule," van der Donk said.

The findings are the result of an unusual collaboration between chemists, biochemists and microbiologists, van der Donk said, all of them affiliates of the Institute for Genomic Biology (IGB) at Illinois. The team included chemistry postdoctoral associate Robert Cicchillo; biochemistry postdoctoral researcher Houjin Zhang, who produced the first crystallographic structure of HEPD; microbiology graduate student Joshua Blodgett; chemistry graduate student John Witteck; and chemistry postdoctoral researcher Gongyong Li. The new study is part of the Mining Microbial Genomes for Novel Antibiotics theme at IGB.

Adapted from materials provided by University of Illinois at Urbana-Champaign.

<http://www.sciencedaily.com/releases/2009/06/090610133457.htm>



Beaked, Bird-like Dinosaur Tells Story Of Finger Evolution



This image shows a reconstruction of Limusaurus; there is no evidence of feather structures. (Credit: Portia Sloan)

ScienceDaily (June 18, 2009) — Scientists have discovered a unique beaked, plant-eating dinosaur in China. The finding, they say, demonstrates that theropod, or bird-footed, dinosaurs were more ecologically diverse in the Jurassic period than previously thought, and offers important evidence about how the three-fingered hand of birds evolved from the hand of dinosaurs.

The discovery is reported in a paper published in the June 18 edition of the journal *Nature*.

"This work on dinosaurs provides a whole new perspective on the evolution of bird manual digits," said H. Richard Lane, program director in the National Science Foundation (NSF)'s Division of Earth Sciences, which funded the research.

"This new animal is fascinating, and when placed into an evolutionary context it offers intriguing evidence about how the hand of birds evolved," said scientist James Clark of George Washington University.

Clark, along with Xu Xing of the Chinese Academy of Science's Institute of Vertebrate Paleontology and Paleoanthropology in Beijing, made the discovery. Clark's graduate student, Jonah Choiniere, also was involved in analyzing the new animal.

"This finding is truly exciting, as it changes what we thought we knew about the dinosaur hand," said Xu. "It also brings conciliation between the data from million-year-old bones and molecules of living birds."

Limusaurus inextricabilis ("mire lizard who could not escape") was found in 159 million-year-old deposits located in the Junggar Basin of Xinjiang, northwestern China. The dinosaur earned its name from the way its skeletons were preserved, stacked on top of each other in fossilized mire pits.

A close examination of the fossil shows that its upper and lower jaws were toothless, demonstrating that the dinosaur possessed a fully developed beak. Its lack of teeth, short arms without sharp claws and possession of gizzard stones suggest that it was a plant-eater, though it is related to carnivorous dinosaurs.

The newly discovered dinosaur's hand is unusual and provides surprising new insights into a long-standing controversy over which fingers are present in living birds, which are theropod dinosaur descendants. The hands of theropod dinosaurs suggest that the outer two fingers were lost during the course of evolution and the inner three remained.

Conversely, embryos of living birds suggest that birds have lost one finger from the outside and one from the inside of the hand. Unlike all other theropods, the hand of *Limusaurus* strongly reduced the first finger and increased the size of the second. Clark and Xu argue that *Limusaurus*' hand represents a transitional condition in which the inner finger was lost and the other fingers took on the shape of the fingers next to them.

The three fingers of most advanced theropods are the second, third and fourth fingers-the same ones indicated by bird embryos-contrary to the traditional interpretation that they were the first, second and third.

Limusaurus is the first ceratosaur known from East Asia and one of the most primitive members of the group. Ceratosaurs are a diverse group of theropods that often bear crests or horns on their heads, and many have unusual, knobby fingers lacking sharp claws.

The fossil beds in China that produced *Limusaurus* have previously yielded skeletons of a variety of dinosaurs and contemporary animals described by Clark and Xu.

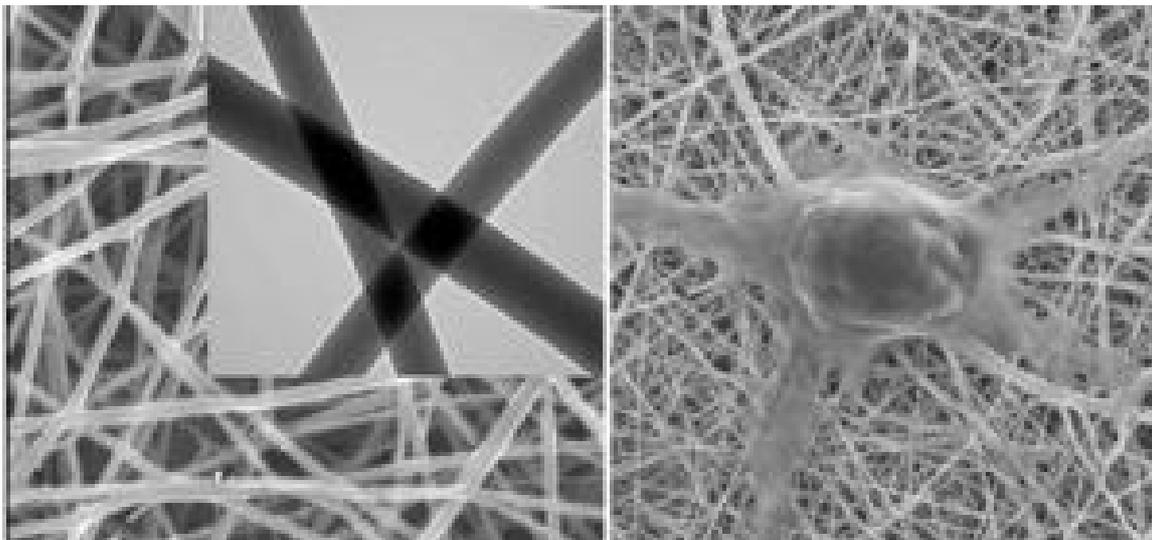
These include the oldest tyrannosaur, *Guanlong wucaii*; the oldest horned dinosaur, *Yinlong downsi*; a new stegosaur, *Jiangjunosaurus junggarensis*; and the running crocodile relative, *Junggarsuchus sloani*.

This research was also funded by the National Geographic Society, the Chinese National Natural Science Foundation, the Jurassic Foundation and the Hilmar Sallee bequest.

Adapted from materials provided by [National Science Foundation](http://www.sciencedaily.com/releases/2009/06/090617171816.htm).

<http://www.sciencedaily.com/releases/2009/06/090617171816.htm>

Crustacean Shell With Polyester Creates Mixed-fiber Material For Nerve Repair



The left panel shows a closeup of chitosan and polyester fibers woven at the nanometer scale. The right panel shows a nerve cell growing on the resulting mesh, which has a texture similar to the body's fibrous connective tissue. (Credit: University of Washington)

ScienceDaily (June 18, 2009) — In the clothing industry it's common to mix natural and synthetic fibers. Take cotton and add polyester to make clothing that's soft, breathable and wrinkle free.

Now researchers at the University of Washington are using the same principle for biomedical applications. Mixing chitosan, found in the shells of crabs and shrimp, with an industrial polyester creates a promising new material for the tiny tubes that support repair of a severed nerve, and could serve other medical uses. The hybrid fiber combines the biologically favorable qualities of the natural material with the mechanical strength of the synthetic polymer.

"A nerve guide requires very strict conditions. It needs to be biocompatible, stable in solution, resistant to collapse and also pliable, so that surgeons can suture it to the nerve," said Miqin Zhang, a UW professor of material science and engineering and lead author of a paper now available online in the journal *Advanced Materials*. "This turns out to be very difficult."

After an injury that severs a peripheral nerve, such as one in a finger, nerve endings continue to grow. But to regain control of the nerve surgeons must join the two fragments. For large gaps surgeons used to attempt a more difficult nerve graft. Current surgical practice is to attach tiny tubes, called nerve guides, that channel the two fragments toward each other.

Today's commercial nerve guides are made from collagen, a structural protein derived from animal cells. But collagen is expensive, the protein tends to trigger an immune response and the material is weak in wet environments, such as those inside the body.

The strength of the nerve guide is important for budding nerve cells.

"This conduit serves as a guide to protect the neuron from injury," Zhang said. "If the tube is made of collagen, it's difficult to keep the conduit open because any stress and it's going to collapse."

Zhang and colleagues developed an alternative. The first component of their material, polycaprolactone, is a strong, flexible, biodegradable polyester commonly used in sutures. It is not suitable on its own for

use as a nerve guide because water-based cells don't like to grow on the polyester's water-repelling surface.

The second component, chitosan, is found in the shells of crustaceans. It's cheap, readily available, biodegradable and biocompatible, meaning that it won't trigger an immune response. Chitosan has a rough surface similar to the surfaces found inside the body that cells can attach to. The problem is chitosan swells in water, making it weak in wet environments.

Researchers combined the fibers at the nanometer scale by first using a technique called electrospinning to draw the materials into nanometer-scale fibers, and then weaving the fibers together. The resulting material has a texture similar to that of the nanosized fibers of the connective tissue that surrounds human cells.

The two materials are different and are difficult to blend, but proper mixing is crucial because imperfectly blended fibers have weak points.

Zhang and colleagues built prototype nerve guides measuring 1.5 millimeters (0.06 inches) in diameter, and between five and 15 centimeters (two to six inches) long. They tested a guide made from the chitosan-polyester blend against another biomaterial under study, polylactideglycolic acid, and a commercially available collagen guide.

Of the three materials, the chitosan-polyester weave showed the most consistent performance for strength, flexibility and resistance to compression under both dry and wet conditions. Under wet conditions, which the researchers say best mimics those in the body, the chitosan-polyester blend required twice as much force to push the tube halfway shut as the other biomaterial, and eight times as much force as the collagen tube.

The new material showed promise for nerve guides but would also work well for wound dressings, heart grafts, tendons, ligament, cartilage, muscle repair and other biomedical applications, Zhang said.

The research was funded by the National Science Foundation through a grant to the UW's Engineered Biomaterials Research Center. Co-authors on the paper are Richard Ellenbogen, Narayan Bhattarai, Zhensheng Li, Jonathan Gunn, Matthew Leung, Ashleigh Cooper, Dennis Edmonson and Omid Veisheh of the UW; Ming-Hong Chen of the National Yang-Ming University in Taiwan; and Yong Zhang of the National University of Singapore.

Adapted from materials provided by [University of Washington](http://www.science.washington.edu).

<http://www.sciencedaily.com/releases/2009/06/090616164002.htm>

Artificial Sweeteners May Contaminate Water Downstream Of Sewage Treatment Plants And Even Drinking Water

ScienceDaily (June 18, 2009) — Sewage treatment plants fail to remove artificial sweeteners completely from waste water. What's more, these pollutants contaminate waters downstream and may still be present in our drinking water. Thanks to their new robust analytical method, which simultaneously extracts and analyses seven commonly used artificial sweeteners, Marco Scheurer, Heinz-Jürgen Brauch and Frank Thomas Lange from the Water Technology Center in Karlsruhe, Germany, were able to demonstrate the presence of several artificial sweeteners in waste water.

Their findings are published online this week in Springer's journal *Analytical and Bioanalytical Chemistry*.

A range of artificial sweeteners are commonly used in food and drinks, as well as drugs and sanitary products. The potential health risks of artificial sweeteners have been debated for some time. Until now, only sucralose has been detected in aquatic environments. Through the use of a new analytical method, the researchers were able to look for seven different artificial sweeteners (cyclamate, acesulfame, saccharin, aspartame, neotame, neohesperidin dihydrochalcone and sucralose) simultaneously, and show, for the first time, that a number of commonly used artificial sweeteners are present in German waste and surface water.

Scheurer and colleagues collected water samples from two sewage treatment plants in Germany – Eggenstein-Leopoldshafen and Karlsruhe – as well as from a soil aquifer treatment site located in a Mediterranean country that treats secondary effluent from a sewage treatment plant.

They tested the water samples using their new analytical method and detected four (acesulfame, saccharin, cyclamate, and sucralose) of seven artificial sweeteners in the waters from the two German sewage treatment plants, indicating incomplete elimination during waste water treatment. Their analyses also showed that these pollutants contaminate rivers and streams receiving water from the sewage treatment plants.

The authors then compared the conventional waste water treatment by sewage treatment plants with advanced waste water treatment by soil aquifer treatment. Traces of artificial sweeteners were present in both cases, proof that water purification was incomplete.

Marco Scheurer concludes: "Due to the use of artificial sweeteners as food additives, the occurrence of artificial sweetener traces in the aquatic environment might become a primary issue for consumer acceptance."

Journal reference:

1. Scheurer et al. **Analysis and occurrence of seven artificial sweeteners in German waste water and surface water and in soil aquifer treatment (SAT)**. *Analytical and Bioanalytical Chemistry*, 2009; DOI: [10.1007/s00216-009-2881-y](https://doi.org/10.1007/s00216-009-2881-y)

Adapted from materials provided by [Springer](http://www.springer.com).

<http://www.sciencedaily.com/releases/2009/06/090617123650.htm>

Much Touted 'Depression Risk Gene' May Not Add To Risk After All

ScienceDaily (June 18, 2009) — Stressful life events are strongly associated with a person's risk for major depression, but a certain gene variation long thought to increase risk in conjunction with stressful life events actually may have no effect, according to researchers funded by the National Institute of Mental Health (NIMH), part of the National Institutes of Health. The study challenges a widely accepted approach to studying risk factors for depression.

"Rigorous re-evaluations of published studies provide the checks and balances necessary for scientific progress," said Thomas R. Insel, M.D., director of NIMH. "We are still in the early days of understanding how genes and environment interact to increase the risk for depression."

Most mental disorders are thought to be caused by a combination of many genetic risk factors interacting with environmental triggers. However, finding the exact combinations continues to present significant challenges to research.

Advances in scientific understanding and technologies during the past decade have led to powerful tools for studying how genetic and environmental factors can affect a person's risk for disease. Such advances allowed mental health researchers in 2003 to show that a gene involved in serotonin activity increased the risk of major depression in people who had a number of stressful life events over a five-year period (see "More About the Science" below for more information about this gene and serotonin). Coming at a time of heightened research interest in these gene-environment interactions and the relative lack of progress in the field for mental disorders, this study received wide acclaim and had a far-reaching influence. Not only have considerable resources been invested in subsequent studies that built on this finding, but also some researchers have proposed marketing the gene test to the public, claiming to be able to predict a person's risk for depression.

However, efforts to replicate the 2003 study's findings—a key step in scientific progress that helps show whether a particular finding was a chance event—have had inconsistent results.

To examine whether the 2003 study's finding had been confirmed, a group of scientists from NIMH and six universities with expertise in epidemiology, biostatistics, genetics, and psychiatry reviewed the status of relevant replication studies. Led by Kathleen Merikangas, Ph.D., of the NIMH Intramural Research Program, the workgroup did a meta-analysis, re-analyzing data on 14,250 participants in 14 studies published from 2003 through March 2009. Of these, the researchers also re-analyzed original data, including unpublished information, on 10,943 participants from 10 studies published before 2008. The workgroup analyzed these original data to see whether there were gender differences in the associations between the serotonin genotype, stressful life events, and depression.

By applying the same definitions of study variables and data analysis methods used in the 2003 study, the workgroup found a strong association between the number of stressful life events and risk of depression across the studies. However, the presumed high-risk version of the serotonin transporter gene did not show a relationship to increased risk for major depression, alone or in interaction with stressful life events, in the analysis of the 14 studies. Their findings were the same in men and women alone in the analysis of original data from 10 studies.

The workgroup noted that their analysis had some limitations. Individual level data were available for only 10 of the 14 studies published before 2008. However, these limitations would have had little effect on the overall findings because the number of participants in the studies not included was only a small proportion of the total sample.

These findings may account for the difficulty many researchers have faced in attempting to replicate the 2003 study. This analysis confirms some earlier reviews that had also questioned the validity of the gene's

effect on depression risk. However, the workgroup emphasized that the intent of its analysis was not to deter research on gene-environment interactions for mental disorders.

"Identifying gene-environment interactions is most successful when studies can focus on a single gene with a major effect, or when the environmental exposure has a strong effect," said lead author Neil Risch, Ph.D., University of California, San Francisco and Kaiser Permanente Northern California. "In the case of modest gene effects or environmental impacts, the statistical power to detect an interaction will be low, and thus weak positive results should be interpreted carefully."

The authors concluded that incorporating environmental exposures in candidate gene studies (those that study a particular gene) may be as likely to yield false positive findings as the candidate gene studies themselves. Therefore, the results of other studies using the same approach as the 2003 study also deserve thorough review and meta-analysis.

"Even though our re-analysis did not confirm an association between the serotonin gene and depression, the finding that the environmental factor was strongly associated with depression in several studies reminds us that environmental factors are also involved in the complex pathways leading to mental disorders," noted Merikangas. "Future progress will require thoughtful integration of the tools of genetics, epidemiology, and clinical and behavioral sciences."

The authors on the paper include Neil Risch, Ph.D., University of California at San Francisco and Kaiser Permanente Northern California; Richard Herrell, Ph.D., NIMH; Thomas Lehner, Ph.D., NIMH; Kung-Yee Liang, Ph.D., Johns Hopkins University; Lindon Eaves, Ph.D., Virginia Commonwealth University; Josephine Hoh, Ph.D., Yale University; Andrea Griem, NIMH; Maria Kovacs, Ph.D., University of Pittsburgh; Jurg Ott, Ph.D., Rockefeller University; Kathleen Ries Merikangas, Ph.D., NIMH.

More About the Science

Serotonin is one of several chemical messengers in the brain, or neurotransmitters, which help brain cells communicate with one another. Among many other functions, serotonin is involved in regulating mood. Problems with making or using the right amount of serotonin have been linked to many mental disorders, including depression, bipolar disorder, anxiety disorder, autism, and schizophrenia.

There are many genes that code for serotonin. Some of these genes guide serotonin production and other are involved in its activity. The serotonin transporter gene makes a protein that directs serotonin from the space between brain cells—where most neurotransmitters are relayed from one cell to another—back into cells, where it can be reused. Since the most widely prescribed class of medications for treating major depression acts by blocking this transporter protein, the gene has been a prime suspect in mood and anxiety disorders. The serotonin transporter gene has many versions. Since everyone inherits a copy of this gene from each parent, a person may have two copies of the same version or one copy each of two different versions. One version of the serotonin transporter gene makes less protein, resulting in decreased transport of serotonin back into cells. This version has also long been the focus of depression research due to its suggested effect on risk.

Journal reference:

1. Neil Risch et al. **Interaction between the Serotonin Transporter Gene, Stressful Life Events and Risk of Depression: A Meta-Analysis.** *Journal of the American Medical Association*, June 17, 2009 [[link](#)]

Adapted from materials provided by [NIH/National Institute of Mental Health](#).

<http://www.sciencedaily.com/releases/2009/06/090616163950.htm>

Definitive Evidence For Ancient Lake On Mars



This is reconstructed landscape showing the Shalbatana lake on Mars as it may have looked roughly 3.4 billion years ago. Data used in reconstruction are from NASA and the European Space Agency. (Credit: G. Di Achille, University of Colorado)

ScienceDaily (June 18, 2009) — A University of Colorado at Boulder research team has discovered the first definitive evidence of shorelines on Mars, an indication of a deep, ancient lake there and a finding with implications for the discovery of past life on the Red Planet.

Estimated to be more than 3 billion years old, the lake appears to have covered as much as 80 square miles and was up to 1,500 feet deep -- roughly the equivalent of Lake Champlain bordering the United States and Canada, said CU-Boulder Research Associate Gaetano Di Achille, who led the study. The shoreline evidence, found along a broad delta, included a series of alternating ridges and troughs thought to be surviving remnants of beach deposits.

"This is the first unambiguous evidence of shorelines on the surface of Mars," said Di Achille. "The identification of the shorelines and accompanying geological evidence allows us to calculate the size and volume of the lake, which appears to have formed about 3.4 billion years ago."

A paper on the subject by Di Achille, CU-Boulder Assistant Professor Brian Hynek and CU-Boulder Research Associate Mindi Searls, all of the Laboratory for Atmospheric and Space Physics, has been published online in *Geophysical Research Letters*, a publication of the American Geophysical Union.

Images used for the study were taken by a high-powered camera known as the High Resolution Imaging Science Experiment, or HiRISE. Riding on NASA's Mars Reconnaissance Orbiter, HiRISE can resolve features on the surface down to one meter in size from its orbit 200 miles above Mars.

An analysis of the HiRISE images indicate that water carved a 30-mile-long canyon that opened up into a valley, depositing sediment that formed a large delta. This delta and others surrounding the basin imply



the existence of a large, long-lived lake, said Hynek, also an assistant professor in CU-Boulder's geological sciences department. The lake bed is located within a much larger valley known as the Shalbatana Vallis.

"Finding shorelines is a Holy Grail of sorts to us," said Hynek.

In addition, the evidence shows the lake existed during a time when Mars is generally believed to have been cold and dry, which is at odds with current theories proposed by many planetary scientists, he said. "Not only does this research prove there was a long-lived lake system on Mars, but we can see that the lake formed after the warm, wet period is thought to have dissipated."

Planetary scientists think the oldest surfaces on Mars formed during the wet and warm Noachan epoch from about 4.1 billion to 3.7 billion years ago that featured a bombardment of large meteors and extensive flooding. The newly discovered lake is believed to have formed during the Hesperian epoch and postdates the end of the warm and wet period on Mars by 300 million years, according to the study.

The deltas adjacent to the lake are of high interest to planetary scientists because deltas on Earth rapidly bury organic carbon and other biomarkers of life, according to Hynek. Most astrobiologists believe any present indications of life on Mars will be discovered in the form of subterranean microorganisms.

But in the past, lakes on Mars would have provided cozy surface habitats rich in nutrients for such microbes, Hynek said.

The retreat of the lake apparently was rapid enough to prevent the formation of additional, lower shorelines, said Di Achille. The lake probably either evaporated or froze over with the ice slowly turning to water vapor and disappearing during a period of abrupt climate change, according to the study.

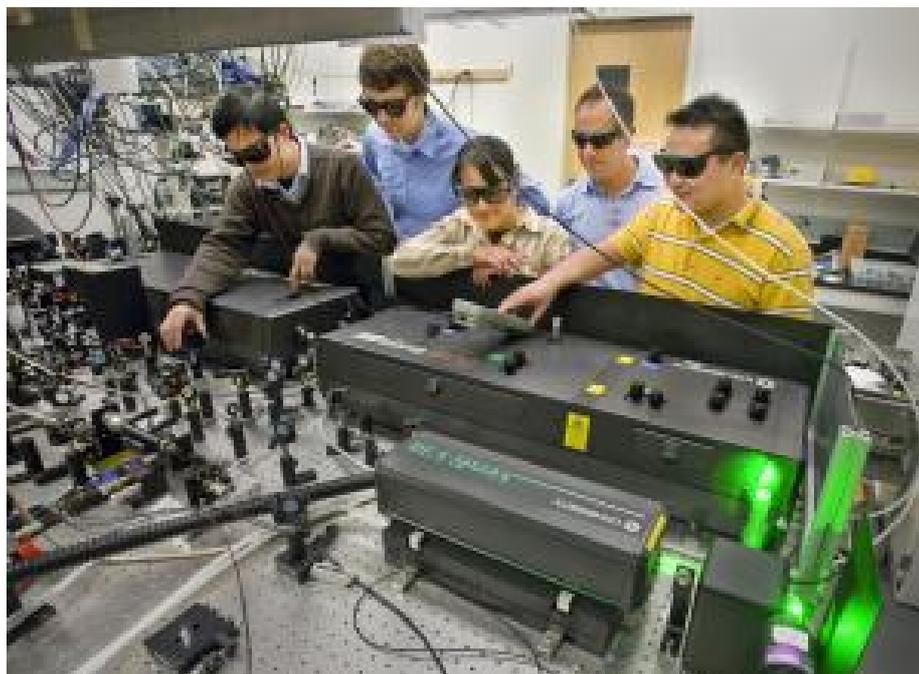
Di Achille said the newly discovered pristine lake bed and delta deposits would be a prime target for a future landing mission to Mars in search of evidence of past life.

"On Earth, deltas and lakes are excellent collectors and preservers of signs of past life," said Di Achille. "If life ever arose on Mars, deltas may be the key to unlocking Mars' biological past."

Adapted from materials provided by University of Colorado at Boulder.

<http://www.sciencedaily.com/releases/2009/06/090617171821.htm>

Nanocrystals Reveal Activity Within Cells



Molecular Foundry post-doctoral researcher Shiwei Wu, staff scientist Jim Schuck, Facility Director Delia Milliron, staff scientist Bruce Cohen and post-doctoral researcher Gang Han demonstrate bright, stable and bio-friendly nanocrystal probes that act as individual investigators of their local environment. (Credit: Image courtesy of DOE/Lawrence Berkeley National Laboratory)

ScienceDaily (June 18, 2009) — Researchers at the U.S. Department of Energy's (DOE) Lawrence Berkeley National Laboratory have created bright, stable and bio-friendly nanocrystals that act as individual investigators of activity within a cell. These ideal light emitting probes represent a significant step in scrutinizing the behaviors of proteins and other components in complex systems such as a living cell.

Labeling a given cellular component and tracking it through a typical biological environment is fraught with issues: the probe can randomly turn on and off, competes with light emitting from the cell, and often requires such intense laser excitation, it eventually destroys the probe, muddling anything you'd be interested in seeing.

“The nanoparticles we've designed can be used to study biomolecules one at a time,” said Bruce Cohen, a staff scientist in the Biological Nanostructures Facility at Berkeley Lab's nanoscience research center, the Molecular Foundry. “These single-molecule probes will allow us to track proteins in a cell or around its surface, and to look for changes in activity when we add drugs or other bioactive compounds.”

Molecular Foundry post-doctoral researchers Shiwei Wu and Gang Han, led by Cohen, Imaging and Manipulation of Nanostructures staff scientist Jim Schuck and Inorganic Nanostructures Facility Director Delia Milliron, worked to develop nanocrystals containing rare earth elements that absorb low-energy infrared light and transform it into visible light through a series of energy transfers when they are struck by a continuous wave, near-infrared laser. Biological tissues are more transparent to near-infrared light, making these nanocrystals well suited for imaging living systems with minimal damage or light scatter.

“Rare earths have been known to show phosphorescent behavior, like how the old-style television screen glows green after you shut it off. These nanocrystals draw on this property, and are a million times more efficient than traditional dyes,” said Schuck. “No probe with ideal single-molecule imaging properties had



been identified to date—our results show a single nanocrystal is stable and bright enough that you can go out to lunch, come back, and the intensity remains constant.”

To study how these probes might behave in a real biological system, the Molecular Foundry team incubated the nanocrystals with embryonic mouse fibroblasts, cells crucial to the development of connective tissue, allowing the nanocrystals to be taken up into the interior of the cell. Live-cell imaging using the same near-infrared laser showed similarly strong luminescence from the nanocrystals within the mouse cell, without any measurable background signal.

“While these types of particles have existed in one form or another for some time, our discovery of the unprecedented ‘single-molecule’ properties these individual nanocrystals possess opens a wide range of applications that were previously inaccessible,” Schuck adds.

“Non-blinking and photostable upconverted luminescence from single lanthanide-doped nanocrystals,” by Shiwei Wu, Gang Han, Delia J. Milliron, Shaul Aloni, Virginia Altoe, Dmitri Talapin, Bruce E. Cohen and P. James Schuck, appears in Proceedings of the National Academy of Sciences and is available in Proceedings of the National Academy of Sciences online.

Work at the Molecular Foundry was supported by the Office of Basic Energy Sciences within the DOE Office of Science.

Adapted from materials provided by DOE/Lawrence Berkeley National Laboratory.

<http://www.sciencedaily.com/releases/2009/06/090616164000.htm>



A Sonic Boom In The World Of Lasers

ScienceDaily (June 18, 2009) — It was an idea born out of curiosity in the physics lab, but now a new type of ‘laser’ for generating ultra-high frequency sound waves instead of light has taken a major step towards becoming a unique and highly useful 21st century technology.

Scientists at The University of Nottingham, in collaboration with colleagues in the Ukraine, have produced a new type of acoustic laser device called a Saser. It’s a sonic equivalent to the laser and produces an intense beam of uniform sound waves on a nano scale. The new device could have significant and useful applications in the worlds of computing, imaging, and even anti-terrorist security screening.

Where a ‘laser’, (Light Amplification by the Stimulated Emission of Radiation), uses packets of electromagnetic vibrations called ‘photons’, the ‘Saser’ uses sound waves composed of sonic vibrations called ‘phonons’. In a laser, the photon beam is produced by stimulating electrons with an external power source so they release energy when they collide with other photons in a highly reflective optical cavity. This produces a coherent and controllable shining beam of laser light in which all the photons have the same frequency and rate of oscillation. From supermarket scanners to DVD players, surgery, manufacturing and the defence industry, the application of laser technology is widespread.

The Saser mimics this technology but using sound, to produce a sonic beam of ‘phonons’ which travels, not through an optical cavity like a laser, but through a tiny manmade structure called a ‘superlattice’. This is made out of around 50 super-thin sheets of two alternating semiconductor materials, Gallium Arsenide and Aluminium Arsenide, each layer just a few atoms thick. When stimulated by a power source (a light beam), the phonons multiply, bouncing back and forth between the layers of the lattice, until they escape out of the structure in the form of an ultra-high frequency phonon beam.

A key factor in this new science is that the Saser is the first device to emit sound waves in the terahertz frequency range... the beam of coherent acoustic waves it produces has nanometre wavelengths (billionths of a metre). Crucially the ‘superlattice’ device can be used to generate, manipulate and detect these soundwaves making the Saser capable of widespread scientific and technological applications. One example of its potential is as a sonogram, to look for defects in nanometre scale objects like micro-electric circuits. Another idea is to convert the Saser beam to THz electromagnetic waves, which may be used for medical imaging and security screening. High intensity sound waves can also change the electronic properties of nanostructures so a Saser could be used as a high-speed terahertz clock to make the computers of the future a thousand times faster.

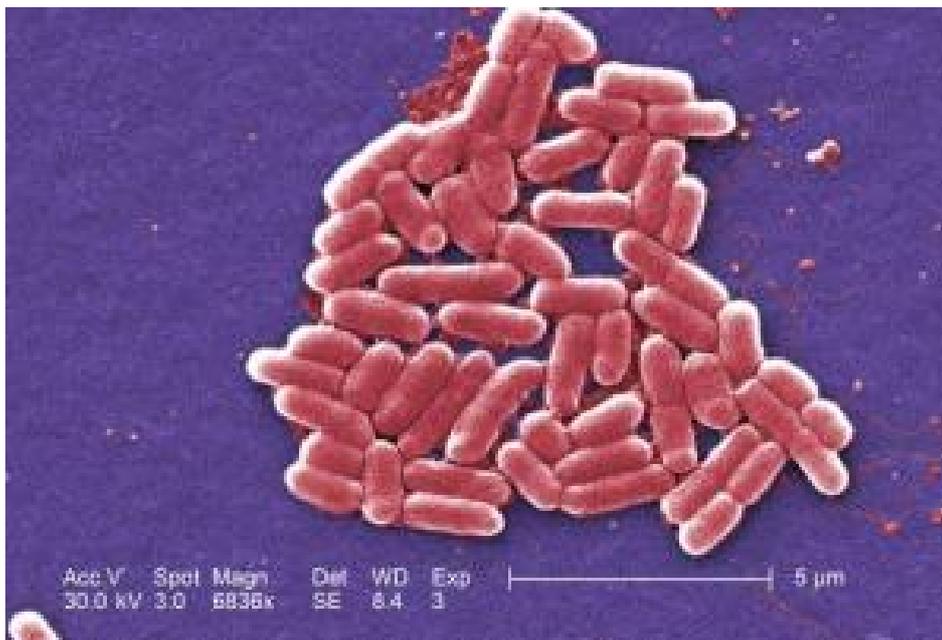
Professor Anthony Kent from the University’s School of Physics and Astronomy, says “While our work on sasers is driven mostly by pure scientific curiosity, we feel that the technology has the potential to transform the area of acoustics, much as the laser has transformed optics in the 50 years since its invention.”

The research team at Nottingham, with help from Borys Glavin of the Lashkarev Institute of Semiconductor Physics in the Ukraine, has won the immediate accolade of the publication of their paper on the Saser experiments in this month’s leading Physics journal, Physical Review. The team has also won a grant of £636,000 from the Engineering and Physical Sciences Research Council to develop Saser technology over the next four years.

Adapted from materials provided by [University of Nottingham](http://www.universityofnottingham.ac.uk).

<http://www.sciencedaily.com/releases/2009/06/090617123652.htm>

Scientists Show Bacteria Can 'Learn' And Plan Ahead



E. coli bacteria. New findings show that these microorganisms' genetic networks are hard-wired to 'foresee' what comes next in the sequence of events and begin responding to the new state of affairs before its onset. (Credit: Image courtesy of Weizmann Institute of Science)

ScienceDaily (June 18, 2009) — Bacteria can anticipate a future event and prepare for it, according to new research at the Weizmann Institute of Science. In a paper that appeared June 17 in *Nature*, Prof. Yitzhak Pilpel, doctoral student Amir Mitchell and research associate Dr. Orna Dahan of the Institute's Molecular Genetics Department, together with Prof. Martin Kupiec and Gal Romano of Tel Aviv University, examined microorganisms living in environments that change in predictable ways.

Their findings show that these microorganisms' genetic networks are hard-wired to 'foresee' what comes next in the sequence of events and begin responding to the new state of affairs before its onset.

E. coli bacteria, for instance, which normally cruise harmlessly down the digestive tract, encounter a number of different environments on their way. In particular, they find that one type of sugar – lactose – is invariably followed by a second sugar – maltose – soon afterward. Pilpel and his team of the Molecular Genetics Department, checked the bacterium's genetic response to lactose, and found that, in addition to the genes that enable it to digest lactose, the gene network for utilizing maltose was partially activated. When they switched the order of the sugars, giving the bacteria maltose first, there was no corresponding activation of lactose genes, implying that bacteria have naturally 'learned' to get ready for a serving of maltose after a lactose appetizer.

Another microorganism that experiences consistent changes is wine yeast. As fermentation progresses, sugar and acidity levels change, alcohol levels rise, and the yeast's environment heats up. Although the system was somewhat more complicated than that of *E. coli*, the scientists found that when the wine yeast feel the heat, they begin activating genes for dealing with the stresses of the next stage. Further analysis showed that this anticipation and early response is an evolutionary adaptation that increases the organism's chances of survival.

Ivan Pavlov first demonstrated this type of adaptive anticipation, known as a conditioned response, in dogs in the 1890s. He trained the dogs to salivate in response to a stimulus by repeatedly ringing a bell before giving them food. In the microorganisms, says Pilpel, 'evolution over many generations replaces



conditioned learning, but the end result is similar.' 'In both evolution and learning,' says Mitchell, 'the organism adapts its responses to environmental cues, improving its ability to survive.' Romano: 'This is not a generalized stress response, but one that is precisely geared to an anticipated event.'

To see whether the microorganisms were truly exhibiting a conditioned response, Pilpel and Mitchell devised a further test for the *E. coli* based on another of Pavlov's experiments. When Pavlov stopped giving the dogs food after ringing the bell, the conditioned response faded until they eventually ceased salivating at its sound. The scientists did something similar, using bacteria grown by Dr. Erez Dekel, in the lab of Prof. Uri Alon of the Molecular Cell Biology Department, in an environment containing the first sugar, lactose, but not following it up with maltose. After several months, the bacteria had evolved to stop activating their maltose genes at the taste of lactose, only turning them on when maltose was actually available.

'This showed us that there is a cost to advanced preparation, but that the benefits to the organism outweigh the costs in the right circumstances,' says Pilpel. What are those circumstances? Based on the experimental evidence, the research team created a sort of cost/benefit model to predict the types of situations in which an organism could increase its chances of survival by evolving to anticipate future events. They are already planning a number of new tests for their model, as well as different avenues of experimentation based on the insights they have gained.

Pilpel and his team believe that genetic conditioned response may be a widespread means of evolutionary adaptation that enhances survival in many organisms – one that may also take place in the cells of higher organisms, including humans. These findings could have practical implications, as well. Genetically engineered microorganisms for fermenting plant materials to produce biofuels, for example, might work more efficiently if they gained the genetic ability to prepare themselves for the next step in the process.

Prof. Yitzhak Pilpel's research is supported by the Ben May Charitable Trust and Madame Huguette Nazez, Paris, France.

Adapted from materials provided by [Weizmann Institute of Science](#), via [EurekAlert!](#), a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090617131400.htm>



Structures From The Human Immune System's Oldest Branch Shed Light On A Range Of Diseases

Molecular structure of factor H bound to C3b. In order to avoid self-attack, regulatory proteins such as factor H bind with C3b, a central component of the enzyme C3 convertase, to help the immune system recognize the body's own tissue and keep complement in check. (Credit: John Lambris, Ph.D., University of Pennsylvania School of Medicine)

ScienceDaily (June 18, 2009) — How molecules of the oldest branch of the human immune system have interconnected has remained a mystery. Now, two new structures, both involving a central component of an enzyme important to the complement system of the immune response, reveal how this system fights invading microbes while avoiding problems of the body attacking itself.

The structures may pave the way to more efficient therapeutics for such complement-mediated diseases as age-related macular degeneration, rheumatoid arthritis, or systemic lupus erythematosus, as well as give insight into the pathogenesis of other immune and inflammatory diseases.

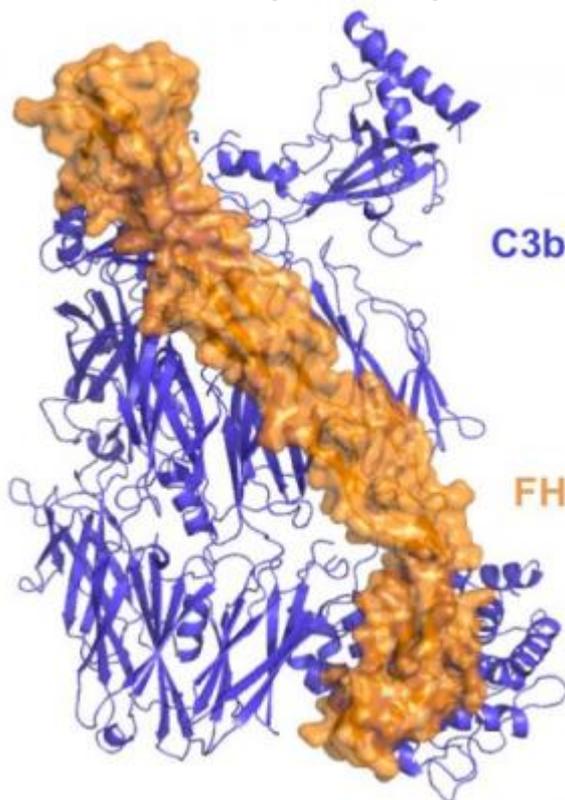
The complement system, an evolutionarily old arm of the immune system, comprises a network of proteins that "complement" the work of antibodies in destroying foreign invaders. They serve as a rapid defense mechanism in most species, from primitive sponges to humans. When complement proteins are triggered into action by a microbe, the proteins ultimately form a complex enzyme called C3 convertase, initiating a cascade of immune and inflammatory reactions. In order to avoid self-attack, regulatory proteins such as factor H bind with C3b, a central component of C3, to help the immune system recognize the body's own tissue and keep complement in check.

Researchers at the University of Pennsylvania School of Medicine, in collaboration with colleagues at Utrecht University in the Netherlands, have determined the structure of C3 convertase and of the C3b fragment in complex with factor H. The work appears this month in two companion papers in *Nature Immunology*.

"Research on the complement system has waited more than 30 years for these structures," says senior author John Lambris, PhD, the Dr. Ralph and Sallie Weaver Professor of Research Medicine at Penn.

In the case of the C3 convertase structure, the researchers were able to make crystals by stabilizing the convertase complex with an inhibitor from the *Staphylococcus aureus* bacteria, called SCIN. SCIN freezes C3 convertase in an inactive state, preventing complement proteins from working further, and in turn, protecting the bacteria from attacking immune cells.

As a central component of C3 convertase, C3b forms an enzyme complex that cleaves its parent molecule C3, which leads to the generation and deposition of more C3b on the bacterial surface. The structure of C3 convertase provides important details about the molecular mechanisms behind these activation and amplification processes. When SCIN is bound to C3 convertase, the enzyme can no longer generate C3b



and amplify the complement response, which likely renders the immune system less effective against staphylococcal infections.

"We plan to look for potential drugs that mimic the interaction of SCIN and C3 convertase and inhibit complement without triggering an adverse immune response," says Lambris. The crystals were therefore examined for critical interaction points between the SCIN inhibitor and C3 convertase.

The second study, describing the structure formed between C3b and factor H, a key regulator of the complement system, is important because of its suspected involvement in a number of immune-related diseases. "It was a surprise to see that the factor H fragment is spread across the entire C3b complex," notes Lambris.

Factor H binding inhibits C3 convertase activity and prevents the complement response from attacking the host's own cells. "This gives us a structural model for designing new therapies for several immune-mediated diseases," said Lambris.

Mutations in factor H are associated with age-related macular degeneration, the major cause of blindness in elderly people in the U.S; atypical hemolytic uremic syndrome, a rare but severe kidney disease that causes acute renal failure and high blood pressure; and membranoproliferative glomerulonephritis type II, another rare, progressive renal disorder also known as dense deposit disease.

"We observed that mutations in factor H could weaken its binding activity to C3b, and thus may lead to a loss of regulatory activity in the disease states," explains Lambris. Correlating disease-related mutations with functional consequences is likely to give insight into the pathogenesis of these and other diseases with immune or inflammatory components.

Current work is focused on designing drugs to counter the effect of SCIN or use it as a template for complement system-targeting therapeutics that target complement-mediated diseases: understanding the implications of the various factor H mutations on diseases, and developing an updated and more dynamic model of complement regulation.

Co-authors in these studies, in addition to Lambris, were Daniel Ricklin, You-Qiang Wu, and Apostolia Tzekou from Penn, who prepared proteins and performed biophysical and biochemical characterization of the complexes, and Piet Gros, Jos van Strijp, Jin Wu, Suzan Rooijackers, Maartje Ruyken, Robert van Domselaar, Karel Planken, and Bert Janssen from Utrecht who prepared additional proteins, formed the structural crystals, and analyzed the effect of SCIN.

This research was supported by the National Institutes of Health and Council for Chemical Sciences of the Netherlands Organization for Scientific Research.

Adapted from materials provided by [University of Pennsylvania School of Medicine](#), via [EurekAlert!](#), a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090617123437.htm>

Therapy Helps Improve Outcomes For Patients With Severe Sepsis

ScienceDaily (June 18, 2009) — A preliminary study suggests that a therapy for severe sepsis or septic shock that included the use of an antibiotic-based "hemoperfusion" device to remove toxic products of bacteria from the blood in addition to conventional treatment resulted in a reduced risk of death and appeared to improve blood circulation and reduce organ dysfunction, according to a new report. Severe sepsis and septic shock are common problems in the intensive care unit and carry a high risk of death. Endotoxin is one of the principal components of a form of bacteria, with high levels of endotoxin activity associated with worse clinical outcomes. Septic shock of intra-abdominal origin is often associated with high endotoxin levels. "Thus, it represents a condition in which endotoxin-targeted therapy may be of particular benefit," the authors write. Polymyxin B fiber column is a medical device designed to reduce blood endotoxin levels in sepsis. Reducing circulating endotoxin levels with polymyxin B (an antibiotic) hemoperfusion (the removal of toxins from the blood; blood filtering) could potentially improve patient clinical outcomes, according to background information in the article.

Dinna N. Cruz, M.D., M.P.H., and Claudio Ronco, M.D., of St. Bortolo Hospital and the International Renal Research Institute Vicenza, Italy, and colleagues conducted a trial to determine whether polymyxin B hemoperfusion added to conventional medical therapy would improve clinical outcomes and survival compared with conventional therapy alone in patients with severe sepsis or septic shock who underwent emergency surgery for intra-abdominal infection. The randomized controlled trial (RCT) was conducted at 10 Italian intensive care units. Patients (n = 64) were randomized to either conventional therapy (n = 30) or conventional therapy plus two sessions of polymyxin B hemoperfusion (n = 34).

"In this RCT of surgical patients with septic shock and severe sepsis induced by abdominal sepsis, polymyxin B hemoperfusion therapy was effective in improving 28-day [mortality was 32 percent (11/34) in the polymyxin B group vs. 53 percent (16/30) in the conventional therapy group] and hospital survival, blood pressure, vasopressor [an agent that increases blood pressure] requirement, and degree of organ failure ... when added to conventional medical treatment," the authors write. "Larger multicenter studies are indicated to confirm these encouraging findings in other patient populations. Furthermore, we advocate further studies to explore the use of newer assays for endotoxin activity both for patient selection, as well as guiding the number of hemoperfusion sessions."

Editorial: International Differences in the Treatment of Sepsis - Are They Justified? In an accompanying editorial, John A. Kellum, M.D., of the University of Pittsburgh, and Shigehiko Uchino, M.D., of the Jikei University School of Medicine, Tokyo, write that the therapy used in this study is common in Japan, but not in the U.S.

"This preliminary study is valuable as an example of 'New Yorkers' testing a Japanese intervention. This kind of cross-community validation is refreshing and necessary but unfortunately only too rare. The results, although preliminary, suggest a number of interesting hypotheses and should provoke further study. This is essential given the significant ongoing problem that sepsis represents."

Journal reference:

1. Dinna N. Cruz; Massimo Antonelli; Roberto Fumagalli; Francesca Foltran; Nicola Brienza; Abele Donati; Vincenzo Malcangi; Flavia Petrini; Giada Volta; Franco M. Bobbio Pallavicini; Federica Rottoli; Francesco Giunta; Claudio Ronco. **Early Use of Polymyxin B Hemoperfusion in Abdominal Septic Shock The EUPHAS Randomized Controlled Trial.** *JAMA*, 2009;301(23):2445-2452 [[link](#)]

Adapted from materials provided by [JAMA and Archives Journals](#).

<http://www.sciencedaily.com/releases/2009/06/090616163954.htm>



Chemists Develop Distributed Drug Discovery: Finding Drugs For Neglected Diseases

ScienceDaily (June 18, 2009) — Researchers from Indiana University-Purdue University Indianapolis (IUPUI) have developed Distributed Drug Discovery (D3), a new low-cost strategy to accelerate the discovery of drugs to treat neglected diseases such as tuberculosis, leprosy, leishmaniasis, dengue fever, and Chagas disease.

Even in times of economic prosperity, the pharmaceutical industry has often been reluctant to get involved in developing treatments for diseases that occur primarily in low income countries. The low cost D3 approach, involving distributed global educational resources at the early stage of discovery, is even more attractive in this time of global economic downturn.

A distributed problem solving process breaks large problems into small pieces which are "distributed" to multiple, small, low-cost sites to obtain a solution. For decades astronomers have enlisted the help of the public, asking individuals around the world to leave their home computers on overnight. While normally idle, each one of these computers looks for patterns in a small subset of the incredibly large amount of space noise signals received by arrays of radio telescopes scanning the skies.

Two studies, published this year in the *Journal of Combinatorial Chemistry*, detail the first two steps in D3, developed by William Scott, Ph.D., research professor, and Martin J. O'Donnell, Ph.D., IUPUI Chancellor's Professor, both of the Department of Chemistry and Chemical Biology at IUPUI.

D3 uses a distributed problem approach at all three key stages of drug discovery. Step one is identifying candidate drug molecules. To do this, IUPUI researchers are soliciting the global advice of computational experts in neglected disease areas and utilizing the computational power of multiple personal computers around the world to scan the almost infinite number of molecules which the D3 synthesis process could make to identify the smaller number of drug candidate molecules they should make. Dr. Scott and Dr. O'Donnell believe this will lead to the selection, synthesis and development of innovative and inexpensive drugs to treat these neglected diseases.

In the second step, D3 uses an innovative, distributed educational approach to synthesize the candidate molecules. Undergraduate and graduate chemistry students from around the world synthesize subsets of these candidate molecules as part of their normal training in synthetic chemistry. Currently students at IUPUI, the University of Indianapolis, and universities in Poland, Russia and Spain have demonstrated their ability to make the molecules (or portions of the molecules) that can be identified by the personal computers as potential candidates for drug discovery.

Initial results are very promising, according to Dr. Scott. "While learning chemistry synthesis skills students across the globe synthesize new molecules to be tested as drug leads. The molecules meet the same quality standards as those required in industry. At the same time the students enthusiastically participate in the synthesis laboratories. They enjoy seeing how their work will advance science that is going to make a difference to individuals suffering from diseases which have been ignored," he said.

The third step in D3 is biological testing of the molecules synthesized by the students. Dr. Scott and Dr. O'Donnell hope the success of distributed problem solving at the computational and synthetic stages of drug discovery will encourage their biological colleagues to develop simple, inexpensive tests to enable students worldwide to participate in this final stage of drug-lead discovery. Currently some of the molecules made are being evaluated through the resources of the National Institutes of Health. In the future, promising drugs will then go on to pre-clinical trials.

"The coordinated and recombined results of these distributed D3 resources can economically accelerate the identification of leads in the early stages of the drug discovery process. Simultaneously, this effort provides educational and job opportunities in both the developed and developing worlds, while building





cultural and economic bridges for the common good," Dr. Scott and Dr. O'Donnell wrote in an accompanying perspective article.

The studies on D3 published in the *Journal of Combinatorial Chemistry* were funded by the National Institutes of Health, National Science Foundation, Camille and Henry Dreyfus Foundation, and Lilly Research Laboratories.

Dr. Scott and Dr. O'Donnell continue to enlist chemistry departments in the United States and other parts of the globe in this program to help children and adults with devastating diseases which have been largely ignored by the developed world.

Adapted from materials provided by Indiana University, via EurekAlert!, a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090615144205.htm>



'Life Force' Linked To Body's Ability To Withstand Stress



An outgoing personality -- especially in senior women -- may increase the human ability to withstand stress-related and inflammatory diseases, new research finds. (Credit: iStockphoto)

ScienceDaily (June 18, 2009) — Our ability to withstand stress-related, inflammatory diseases may be associated, not just with our race and sex, but with our personality as well, according to a study published in the July issue of the journal *Brain, Behavior and Immunity*. Especially in aging women, low levels of the personality trait extraversion may signal that blood levels of a key inflammatory molecule have crossed over a threshold linked to a doubling of risk of death within five years.

An emerging area of medical science examines the mind-body connection, and how personality and stress contribute to disease in the aging body. Long-term exposure to hormones released by the brains of people under stress, for instance, takes a toll on organs. Like any injury, this brings a reaction from the body's immune system, including the release of immune chemicals that trigger inflammation in an attempt to begin the healing process. The same process goes too far as part of diseases from rheumatoid arthritis to Alzheimer's disease to atherosclerosis, where inflammation contributes to clogged arteries, heart attacks and strokes.

The current study found that extroverts, and in particular those high "dispositional activity" or engagement in life, have dramatically lower levels of the inflammatory chemical interleukin 6 (IL-6). Swiss psychiatrist Carl Jung defined extroverts as focused on the world around them and most happy when active and surrounded by people. Introverts looked inward and were shy.

The definitions of extraversion and other personality traits were refined by American psychologist Gordon Allport beginning in the 1930s. He reviewed all adjectives in the dictionary used to describe personality, and attempted to group them into clusters. Over the next several decades, researchers statistically analyzed these dictionary terms and discovered that they tended to cluster into five general dimensions: extraversion vs. introversion, emotional stability vs. neuroticism, openness vs. closed-

mind, agreeable vs. hostile, and conscientiousness vs. unreliability. These dimensions, known as the "Five Factor Model" of personality, served to organize hundreds of specific traits like "activity" for psychologists, similar to the way the Periodic Table organizes elements for physicists.

"Our study took the important first step of finding a strong association between one part of extroversion and a specific, stress-related, inflammatory chemical," said Benjamin Chapman, Ph.D., assistant professor within the Rochester Center for Mind-Body Research (RCMBR), part of the Department of Psychiatry at the University of Rochester Medical Center, and lead author of the study. "The next step is to determine if one causes the other. If we knew the direction and mechanism of causality, and it were low dispositional activity causing inflammation, we could design treatments to help high-risk patients become more engaged in life as a defense against disease."

Some past studies had contended, and the current analysis agreed, that women and minorities have higher levels of IL-6 than white males on average. Women may be more vulnerable to stress because of hormonal differences and minorities because of factors like perceived racism, but those questions have yet to be fully answered. While these trends exist, variations within these large groups are so great that further risk markers are needed to better determine any given patient's actual risk. The current study looked whether particular personality traits, including low extroversion, were associated with IL-6 levels in a sample of 103 urban primary care patients aged 40 and older.

You Must Have Been a Calm Baby

According to landmark studies in the early 1990s, extroversion is a personality trait with three parts: a tendency toward happy thoughts, a desire to be around others and "dispositional energy," a sense of innate vigor or active engagement with life ("I'm bursting with energy; my life is fast-paced"). Other dimensions of extroversion, such as sensation-seeking, have also been proposed.

While the first two extrovert qualities were not found to track with inflammation, the current study found increases in "dispositional activity" came with statistically significant decreases in IL-6 ($p = .001$). P values measure the weight that should be attributed to a finding, with values less than .05 usually deemed significant.

In the current study, a patient's degree of extroversion was determined by standard tests, including the NEO Five-Factor Inventory, an instrument based on the Five Factor Model. The study found that the difference between the 84th percentile of dispositional activity and the 16th translated roughly into a 1.29 picogram increase in IL-6 per milliliter of blood.

Those findings took on meaning when comparisons revealed that, for both white and minority women, the difference between high and low dispositional energy was enough to shift IL-6 levels above 3.19 pg/ml, the threshold established by a large, epidemiological study (Harris et al., 1999) over which five-year mortality risk was found to double.

"If this aspect of personality drives inflammation, dispositional energy and engagement with life may confer a survival advantage," Chapman said. "But we don't know if low dispositional activity is causing inflammation, or inflammation is taking its toll on people by reducing these personality tendencies, so we must be cautious in our interpretation of this association."

The findings recall an idea described as early as 1911 by French philosopher Henri Bergson that he called *élan vital* or "life force," according to the authors. This aspect of adult personality may be linked to childhood temperament as well. Some babies are very relaxed, others active. Activity level may reflect a fundamental, biologically-based energy reserve, although no one has explained the biochemistry behind it.

The team gauged the magnitude of IL-6 associations for gender, race/ethnicity and personality by examining the degree to which each factor was associated with differences between people in IL-6. Of the differences in inflammation found in the patient sample in levels of IL-6, about 9 percent of the difference was due to gender, 6 percent was due to dispositional activity levels and another 4 percent to race/ethnicity. That a personality trait may contribute more to IL-6 levels than race/ethnicity was "a great surprise."

Along with Chapman and Jan Moynihan, Ph.D., director of the RCMBR, Ayesha Khan, Mary Harper, James Walton, Paul Duberstein, Nancy Talbot and Jeffrey Lyness assisted in the study.

Doug Stockman and Kevin Fiscella from the departments of Family Medicine and Community and Preventive Medicine at the Medical Center made important contributions as well. The work was supported by the General Clinical Research Center (GCRC) at the Medical Center and by the National Center for Research Resources, part of the National Institutes of Health.

While it may difficult for patients to change their nature, part of the solution may be physical exercise as a therapy. The activity component of extraversion has been linked with exercise by past studies, as has daily physical activity with lower IL-6 levels in the aging. Still, the team is not convinced that exercise represents the whole answer.

"Beyond physical activity, some people seem to have this innate energy separate from exercise that makes them intrinsically involved in life," Chapman said. "It will be fascinating to investigate how we can increase this disposition toward engagement. Potentially, you might apply techniques developed to treat depression like 'pleasurable event scheduling' to patients with low dispositional energy, where you get people more involved in life by filling their time with things they enjoy as a therapy."

Journal reference:

1. Chapman et al. **Gender, race/ethnicity, personality, and interleukin-6 in urban primary care patients.** *Brain Behavior and Immunity*, 2009; 23 (5): 636 DOI: [10.1016/j.bbi.2008.12.009](https://doi.org/10.1016/j.bbi.2008.12.009)

Adapted from materials provided by [University of Rochester Medical Center](http://www.rockefeller.edu).

<http://www.sciencedaily.com/releases/2009/06/090617123700.htm>

Discoveries That Saved The Large Blue Butterfly Detailed



Maculinea arion female in Dartmoor, UK. (Credit: David Simcox, Centre for Ecology and Hydrology, UK)

ScienceDaily (June 18, 2009) — On the 25th anniversary of the project that brought the large blue butterfly back from extinction in the United Kingdom, ecologists are for the first time publishing the decades of research that helped them rescue this spectacular butterfly.

The study shows how the large blue's extreme dependence on a single ant species led to the butterflies' demise, as their habitat became overgrown, causing soil temperatures to drop and ant numbers to diminish. Before this discovery, butterfly collectors were generally blamed for the decline of this butterfly, also known as *Maculinea arion*.

The research, by Jeremy Thomas of the University of Oxford in Oxford, UK and the Centre for Ecology and Hydrology in Wallingford, and his colleagues, will be published online by *Science*, at the *Science* Express website, on 18 June 2009. *Science* is published by AAAS, the nonprofit, international science society.

"This study tells the story of a remarkable, 40-year research effort that began with painstaking fieldwork - including the counting of individual butterfly eggs laid on flowers in the English countryside -- and culminated with a major conservation victory. Science is delighted to be publishing this impressive body of work, and we expect that the peer-reviewed data will be an important tool for future conservation efforts," said Andrew Sugden, Deputy and International Managing Editor at Science.

"Human beings are so much larger than insects, it's very hard for us to appreciate that what to us is an imperceptible change in habitat can have devastating consequences for a species like the bizarre and beautiful large blue butterfly. A difference of a centimeter in grass length can change the soil temperature by 2 or 3 degrees C. If you're the size of an ant or butterfly that difference is massive," said Thomas.

In the 1970s, the International Union for Conservation of Nature selected three butterflies, including the large blue, as global flagships for the cause of lepidopteran conservation. These insects and others had been mysteriously disappearing for decades, despite attempts to save them.

The large blue butterfly was selected because of its beauty and prize-status for collectors, and because of its unusual life cycle, according to Thomas.

Adult *M. arion* females lay their eggs on thyme flowers in the summer. After hatching, the caterpillars stay very small and many eventually fall to the ground. They secrete chemicals that attract red ants and

fool them into thinking the caterpillars are ant grubs. The ants then carry the tiny caterpillars into their underground nests.

In most cases, only caterpillars that have landed in the nest of one particular ant species, *Myrmica sabuleti*, will survive to adulthood. The caterpillars' secretions are a sufficiently close match to those of *M. sabuleti* grubs that the ants never discover that they have been duped, and instead continue to protect the caterpillars for 10 months even though they are feeding on the ants' own brood. In early June, the caterpillars form a chrysalis near the colony entrance and then emerge to crawl aboveground two weeks later as butterflies.

While ecologists generally knew about this life cycle, the butterfly's intense dependence on *M. sabuleti* ants only came to light once Thomas began studying Britain's last surviving large blue butterfly colony.

"It was the nearest insect equivalent to living with the apes, I suppose," said Thomas.

"From May to late September, I was living with the last UK colony, measuring everything, including their behavior, how many eggs they laid, the survival of individual eggs, how many caterpillars were in the plants. It was a bit like a detective story."

The butterflies finally disappeared from Britain in 1979.

Thomas compiled this information into life tables, which show the number of new eggs and those that survived each year from 1972 to 1977, and which are now being published for the first time in the Science study.

With these field data, Thomas and his coauthors explored the possible factors that could be causing the butterflies decline. They realized that the grass in the butterflies' habitat had grown too long, as farmers had gradually stopped grazing their livestock on these hillsides and a viral infection had killed many of the wild rabbits in the 1950s.

The soil on these overgrown grasslands was therefore too cool to support adequate numbers of *M. sabuleti* ants. And, without enough ants to raise their young, the large blue butterflies dwindled. The researchers combined these ecological relationships into a numerical model, which is also being published for the first time in the Science study.

"I've been saving this paper up, as it were, for 25 years. None of the data points have been published. The life-cycle data and the life tables generated a model upon which all our conservation efforts were based. The description of this model is also new. There are few known examples of a model being able to predict the success of a conservation effort as well as ours did, for any insect," Thomas said.

In the late 1970s, after 40 years of trying to save the large blue by fending off butterfly collectors, conservationists followed Thomas' recommendations and restored the butterfly's proper habitat by clearing scrub and reintroducing grazing animals.

Starting in 1983, Thomas and his colleagues began introducing large blue butterflies imported from Sweden, into restored habitat sites. As of 2008, the butterflies occupied 30 percent more colonies than they had in the 1950s, before the major decline began. The large blue is now one of just three UK butterflies on course to meet the Convention of Biological Diversity's target to reverse species' declines by 2010. This rebound has closely followed the predictions generated by Thomas' model.

The picture in the rest of Europe is hazier, with the butterflies faring better in some countries than others. The data in this paper lay out the basis for similar restoration efforts for other butterflies with specific host requirements, such as the four related, globally threatened, species of large blue that are already

starting to benefit from this approach across Europe, and the recovery of the Adonis blue butterfly from the brink of national extinction in the UK, according to Thomas.

He said that, while conservation efforts used to tend to focus on adult butterflies, this research has shown that the needs of juveniles are often much more specific and can primarily drive a population's overall health. Being aware of this fact may allow ecologists to take a shortcut around compiling the time-consuming life tables that are traditionally the first step in understanding why a species is declining.

Restoring the large blue's habitat may also provide collateral benefits for other species that live there, the authors speculate in their study. On some of its conservation sites there have already been dramatic increases in rare birds, plants and other butterflies, such as the wood lark, pale heath violet and the pearl-bordered fritillary, Thomas said.

Prof. Thomas' coauthors are David Simcox of the Centre for Ecology and Hydrology in Wallingford, UK and Ralph Clarke of the Centre for Ecology and Hydrology in Wallingford, UK and Bournemouth University in Poole, UK.

This research was funded by EU Macman and Biodiversa (CLIMIT) programs, Natural England, CEH, National Trust, Somerset Wildlife Trust, Network Rail, J&F Clark Trust, Butterfly Conservation, Gloucester Wildlife Trust, Millfield School, Defra, WWF, Sir Terence Conran, Holland & Barrett, Hydrex, ICI, and R Mattoni.

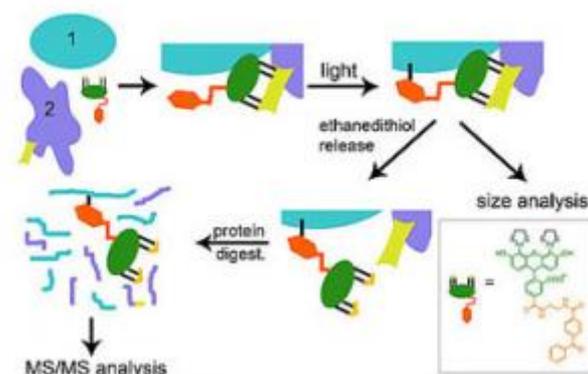
Journal reference:

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Adapted from materials provided by American Association for the Advancement of Science, via EurekaAlert!, a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090615185420.htm>

TRAPping Proteins That Work Together Inside Living Cells



TRAP (in green, orange and yellow) binds to a tag on known protein (#2). Light crosslinks TRAP's benzophenone to mystery protein (#1). Subsequent biochemical analysis reveals clues to unknown protein (#1). (Credit: Image courtesy of DOE/Pacific Northwest National Laboratory)

ScienceDaily (June 18, 2009) — DNA might be the blueprint for living things, but proteins are the builders. Researchers trying to understand how and which proteins work together have developed a new crosslinking tool that is small and unobtrusive enough to use in live cells. Using the new tool, the scientists have discovered new details about a well-studied complex of proteins known as RNA polymerase. The results suggest the method might uncover collaborations between proteins that are too brief for other techniques to pinpoint.

"Conventional methods used to find interacting proteins have limitations that we are trying to circumvent," said biochemist Uljana Mayer of the Department of Energy's Pacific Northwest National Laboratory. "They also create conditions that are different from those inside cells, so you can't find all the interactions that proteins would normally engage in."

Proteins are the workhorses in an organism's cells. Whole fields of research are dedicated to teasing out which proteins work together to make cells function. For example, drug researchers seek chemicals that disrupt or otherwise change how proteins interact to combat diseases; environmental scientists need to understand how proteins collaborate in ecosystems to make them thrive or fail.

To learn about protein networks, scientists start with a familiar one and use it as bait to find others that work alongside it. To pin down the collaborators, researchers make physical connections between old and new proteins with chemicals called crosslinkers. The sticky crosslinkers will only connect proteins close enough to work together, the thinking goes. But most crosslinkers are too large to squeeze into living cells, are harmful to cells, or link proteins that are neighbors but not coworkers.

To address these issues, Mayer and her PNNL colleagues developed a crosslinking method that uses small crosslinkers whose stickiness can be carefully controlled. To find coworkers of a protein of interest, Mayer and her colleagues build a tiny molecule called a tag into the initial protein. They then add a small molecule called TRAP to the living cell, which finds and fits into the tag like two pieces in a puzzle. TRAP waves around, bumping into nearby proteins. The scientists control TRAP with a flash of light, causing it to stick to coworkers it bumps into. The researchers then identify the new "TRAPPED" proteins in subsequent analyses.

To demonstrate how well this method works, Mayer and colleagues tested it out on RNA polymerase, a well-studied machine in cells. The polymerase is made up of many proteins that cooperate to translate DNA. One of the polymerase proteins has a tail that is known to touch the DNA and some helper proteins

just before the polymerase starts translating. No one knew if this tail -- also known as the C-terminus of the alpha subunit -- touches anything else in the core of the RNA polymerase complex.

The team engineered a tag in the C-terminus and cultured bacteria with the tagged RNA polymerase. After adding TRAP to the cells and giving it time to find the C-terminus tag, the team shined a light on the cultures.

The team then identified the proteins marked with TRAP using instruments in EMSL, DOE's Environmental Molecular Sciences Laboratory on the PNNL campus. They found that the tagged protein, as expected, interacts with many other proteins, for example previously identified helper proteins, so-called transcription factors. But they also found it on another core protein called the beta subunit, suggesting the tail of the alpha subunit makes contact with the beta subunit as it plugs along. This interaction had never been seen before.

"No one knows what the polymerase looks like when it is running," said Uljana Mayer. "Here we see the C-terminus swings back to grab the beta subunit once the polymerase starts working."

The team report their results June 15 in the journal *ChemBioChem*. The tag in their unique method is made up of a "tetracysteine motif" -- two pairs of the amino acid cysteine separated by two other amino acids that doesn't interfere with the normal function of the protein of interest. TRAP includes a small "biarsenical" probe, which fluoresces so the team can find the proteins to which it has become attached. TRAP can also be easily unlinked from the tag with a simple biochemical treatment, allowing researchers to piece out the coworker from their original protein of interest.

The team also tested the method on other proteins, such as those found in young muscle cells. Mayer said they will use the method in the future to understand how environmental conditions affect how proteins work together in large networks.

Journal reference:

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Adapted from materials provided by [DOE/Pacific Northwest National Laboratory](http://www.doe.gov).

<http://www.sciencedaily.com/releases/2009/06/090615144217.htm>

Novel DNA Vaccine Leads To Kidney Damage Prevention In Systemic Lupus Erythematosus Models

ScienceDaily (June 18, 2009) — DNA vaccination using lupus autoantigens and interleukin-10 (IL-10, a cytokine that plays an important role in regulating the immune system) has potential as a novel therapy to induce antigen specific tolerance and may help to prevent kidney damage in patients with systemic lupus erythematosus (SLE), according to a new study presented June 11 at EULAR 2009, the Annual Congress of the European League Against Rheumatism in Copenhagen, Denmark.

SLE is a complex, chronic autoimmune disease that causes inflammation and damage to body tissues. Inflammation of the kidney can cause kidney failure, often a significant complication of SLE associated with the more severe forms of the disease, and the primary cause of disability that leads to other fatal complications in people with the condition.

In the study, one group of experimental mice was vaccinated with Sm (Smith antigens that are small nuclear ribonucleoproteins: snRNPs) lupus autoantigen in combination with IL-10 and another group vaccinated with the same antigen and IFN-gamma, both signaling molecules involved in the immune process. SLE was induced in the mice and the levels of antibodies against various lupus autoantibodies were analysed. The study found that levels of anti-Sm antibodies in the IL-10 vaccinated group were lower than those in the group vaccinated with IFN-gamma ($p=0.026$, statistically significant).

Interestingly, the prevalence and levels of other autoantibodies such as anti-Argonaute2 (Ago2)/Su and chromatin did not differ between the groups, indicating that the vaccination was Sm antigen-specific and successfully targeting particular antibodies. Significant proteinuria (a urinary condition which can indicate kidney damage) ($>1.5+$) was less common in the IL-10 vaccinated group compared with the IFN-gamma group, which may suggest a beneficial role for IL-10 vaccination in preventing kidney damage associated with SLE.

Dr Monica Vazquez del Mercado, Head of the Instituto de Investigación en Reumatología y del Sistema Músculo Esquelético of the Universidad de Guadalajara, Mexico, corresponding author of the study, said: "Some autoantibodies are specific for SLE and are considered to be characteristic of the condition. The mechanisms that regulate the production of these antibodies are poorly understood, however, the results of our study have identified one possible way of influencing the pathway behind kidney damage in SLE."

Studies in human and mouse models of lupus have revealed that the major epitopes of the anti-Sm antibodies are present at specific locations (D1, D2 and B/B') of the Sm antigens. Researchers in this study prepared DNA vaccines of Sm D1, D2, B/B', B/B'COOH, IFN-gamma and IL-10 using direct cloning techniques with pcDNA^{3.1}D/V5-His-TOPO® and purified these using Qiagen Endo-Free Giga Prep Kit. Eight groups of 6 week-old female BALB/c mice (13/group) received intramuscular injections of 100 micrograms of the vaccination preparation at days 2 and 9. At day 16, mice were induced with experimental SLE.

Serum samples were collected at day 0 and then monthly for analysis of autoantibodies and immunoglobulin levels. Serum autoantibodies were tested by immunoprecipitation and ELISA. Proteinuria (excessive protein in the urine) was assessed monthly using Multistix®. Kidney pathology and immune complex deposition were examined at 6 months.

Adapted from materials provided by [European League Against Rheumatism](#), via [EurekAlert!](#), a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090611110952.htm>

Maya Intensively Cultivated Manioc 1,400 Years Ago



CU-Boulder anthropology Professor Payson Sheets and his team uncovered a manioc field one-third the size of football field buried under 10 feet of ash by the eruption of a volcano about 1,400 years ago that blanketed the Mayan farming village of Ceren in El Salvador. (Credit: Image courtesy University of Colorado)

ScienceDaily (June 17, 2009) — A University of Colorado at Boulder team has uncovered an ancient and previously unknown Maya agricultural system -- a large manioc field intensively cultivated as a staple crop that was buried and exquisitely preserved under a blanket of ash by a volcanic eruption in present-day El Salvador 1,400 years ago.

Evidence shows the manioc field -- at least one-third the size of a football field -- was harvested just days before the eruption of the Loma Caldera volcano near San Salvador in roughly A.D. 600, said CU-Boulder anthropology Professor Payson Sheets, who is directing excavations at the ancient village of Ceren. The cultivated field of manioc was discovered adjacent to Ceren, which was buried under 17 feet of ash and is considered the best preserved ancient farming village in all of Latin America.

The ancient planting beds of the carbohydrate-rich tuber are the first and only evidence of an intensive manioc cultivation system at any New World archaeology site, said Sheets. While two isolated portions of the manioc field were discovered in 2007 following radar work and limited excavation, 18 large test pits dug in spring 2009 -- each measuring about 10 feet by 10 feet -- allowed the archaeologists to estimate the size of the field and assess the related agricultural activity that went on there.

Sheets said manioc pollen has been found at archaeological sites in Belize, Mexico and Panama, but it is not known whether it was cultivated as a major crop or was just remnants of a few garden plants. "This is the first time we have been able to see how ancient Maya grew and harvested manioc," said Sheets, who discovered Ceren in 1978. Ash hollows in the manioc planting beds at Ceren left by decomposed plant material were cast in dental plaster by the team to preserve their shape and size, said Sheets. Evidence showed the field was harvested and then replanted with manioc stalk cuttings just a few days before the eruption of the volcano.

A few anthropologists have suspected that manioc tubers -- which can be more than three feet long and as thick as a man's arm -- were a dietary salvation for ancient, indigenous societies living in large cities in tropical Latin America. Corn, beans and squash have long been known to be staples of the ancient Maya, but they are sensitive to drought and require fertile soils, said Sheets.

"As 'high anxiety' crops, they received a lot of attention, including major roles in religious and cosmological activities of the Maya," said Sheets. "But manioc, which grows well in poor soils and is

highly drought resistant did not. I like to think of manioc like an old Chevy gathering dust in the garage that doesn't get much attention, but it starts right up every time when the need arises."

Calculations by Sheets indicate the Ceren planting fields would have produced roughly 10 metric tons of manioc annually for the 100 to 200 villagers believed to have lived there. "The question now is what these people in the village were doing with all that manioc that was harvested all at once," he said. "Even if they were gorging themselves, they could not have consumed that much."

The CU-Boulder team also found the shapes and sizes of individual manioc planting ridges and walkways varied widely. "This indicates the individual farmers at Ceren had control over their families' fields and cultivated them the way they wanted, without an external higher authority telling them what to do and how to do it," he said.

The team also found that the manioc fields and adjacent cornfields at Ceren were oriented 30 degrees east of magnetic north -- the same orientation as the village buildings and the public town center, said Sheets. "The villagers laid out the agricultural fields and the town structures with the same orientation as the nearby river, showing the importance and reverence the Maya had for water," he said.

The volcano at Ceren shrouded adobe structures, thatched roofs, house beams, woven baskets, sleeping mats, garden tools and grain caches. The height of the corn stalks and other evidence indicate the eruption occurred early on an August evening, he said. Because it is unlikely that the people of Ceren were alone in their intensive cultivation of manioc, Sheets and his colleagues are now investigating chemical and microscopic botanical evidence at other Maya archaeological sites that may be indicators of manioc cultivation and processing.

Sheets said Maya villagers living in the region today have a long tradition of cutting manioc roots into small chunks, drying them eight days, then grinding the chunks into a fine, flour-like powder known as almidón. Almidón can be stored almost indefinitely, and traditionally was used by indigenous people in the region for making tamales and tortillas and as a thickening agent for stews, he said.

Since indigenous peoples in tropical South America use manioc today to brew alcoholic beverages, including beer, the CU-Boulder team will be testing ceramic vessels recovered from various structures at Ceren for traces of manioc. To date, 12 structures have been excavated, and others detected by ground-penetrating radar remain buried, he said. Sheets is particularly interested in vessels from a religious building at Ceren excavated in 1991. The structure contained such items as a deer headdress painted red, blue and white; a large, alligator-shaped painted pot; the bones of butchered deer; and evidence that large quantities of food items like meat, corn, beans and squash were prepared on-site and dispensed to villagers from the structure, said Sheets.

Ceren's residents apparently were participating in a spiritual ceremony in the building when the volcano erupted, and did not return to their adobe homes, which excavations showed were void of people and tied shut from the outside. "I think there may have been an emergency evacuation from the ceremonial building when the volcano erupted," he said. To date, no human remains have been found at Ceren.

The research team also included CU-Boulder doctoral student Christine Dixon, Professor David Letz and graduate student Angie Hood from the University of Cincinnati, University of Costa Rica graduate student George Maloof and University of Central Florida graduate student Andrew Tetlow. The research was funded by the National Science Foundation.

Adapted from materials provided by [University of Colorado at Boulder](http://www.sciencedaily.com/releases/2009/06/090616133940.htm).

<http://www.sciencedaily.com/releases/2009/06/090616133940.htm>

Plant Microbe Shares Features With Drug-resistant Pathogen



Daniel (Niels) van der Lelie. (Credit: Image courtesy of DOE/Brookhaven National Laboratory)

ScienceDaily (June 17, 2009) — An international team of scientists has discovered extensive similarities between a strain of bacteria commonly associated with plants and one increasingly linked to opportunistic infections in hospital patients. The findings suggest caution in the use of the plant-associated strain for a range of biotech applications.

The genetic analysis was conducted in part at the U.S. Department of Energy's (DOE) Brookhaven National Laboratory, and will be published in the July 2009 issue of *Nature Reviews Microbiology*, now available online.

The research team — which included scientists from Ireland, Austria, and the United Kingdom as well as the U.S. — was investigating the versatility and adaptability of a group of bacteria known as *Stenotrophomonas*. These bacteria have great metabolic versatility, allowing them to thrive in very diverse environments.

The scientists were particularly interested in comparing two strains of *S. maltophilia* whose genomes were recently decoded to see why these strains — one isolated as an opportunistic pathogen from a clinical setting (strain K279a), and the other from the roots of poplar trees (strain R551-3) — were so well-suited to their very different environments. Such comparisons are made possible by the high throughput and cost-effective DNA sequencing capacity developed by DOE's Joint Genome Institute, as well as the Sanger Institute, to help elucidate the role of microorganisms in health, energy, and environmental processes.

“Surprisingly, we observed very few differences between the opportunistic pathogen and the common plant bacterium,” said Brookhaven Lab microbiologist Daniel (Niels) van der Lelie, an expert on soil- and plant-associated microbes, whose team provided the data on the plant-dwelling strain.

For one thing, the scientists found genes that make the bacteria resistant to a wide range of antibiotics in both strains. "This suggests that antibiotic resistance is part of the species' core genome, and not a trait acquired in the hospital," van der Lelie said. Multi-drug antibiotic-resistance is one key feature that allows some bacteria to cause deadly infections in hospital patients whose immune systems are often compromised.

The scientists are also intrigued about similarities in the mechanisms the two strains use to colonize their respective environments. For example, both strains possess very similar mechanisms to produce glue-like substances, or biofilms, which allow them to adhere to plant roots, in one case, and medical devices such as ventilation tubes and intravenous catheters, in the other. Such devices are a common source of exposure to opportunistic pathogens for hospital patients.

Implications

"Soil microorganisms have long been a source and inspiration for the synthesis of antibiotics," van der Lelie said. "These finding will help us to better understand the potential of bacteria to produce or become resistant to antimicrobial compounds."

The findings may also reveal new targets for the development of drugs to interfere with microbes' ability to form sticky, infection-fostering biofilms, or point the way to closely related non-pathogenic strains that could be useful and benign for biotech applications.

On the other hand, these findings raise the question of whether plants in hospital settings may serve as a reservoir for opportunistic pathogens or antibiotic resistance genes. "This is something that should be looked at more closely by experts in infectious diseases," van der Lelie said.

The findings also suggest caution in using this particular strain of plant-dwelling bacteria for a range of biotech applications for which it and other plant-associated microbes have shown promise. These include: stimulating plant growth and protecting plants against pathogens; the breakdown of natural and man-made pollutants via bioremediation and phytoremediation; and the production of useful biomolecules such as drugs or industrial enzymes.

Based on the results of this study, van der Lelie's group has ruled out *S. maltophilia* for biotech applications designed to increase plant growth. "The work in our lab is presently concentrating on two other plant-growth promoting bacteria, *Pseudomonas putida* W619 and *Enterobacter* sp. 638, neither of which contain broad spectrum antibiotic resistance or virulence factors that would allow them to behave as opportunistic pathogens," he said. "We are certain about this after carefully analyzing the genome sequences of these strains."

Co-authors on this study include: Robert Ryan and J. Maxwell Dow of University College Cork, Ireland; Sebastien Monchy and Safiyh Taghavi of Brookhaven Lab; Massimiliano Cardinale and Gabriele Berg of Graz University of Technology, Austria; Lisa Crossman of The Wellcome Trust Sanger Institute, UK; and Matthew B. Avison of the University of Bristol, UK.

Brookhaven Lab's contribution to this study was supported by grants from DOE's Office of Science, Laboratory Directed Research and Development funds, and by Royalty Funds at Brookhaven Lab under contract with DOE. Sequencing of R551-3 was performed at the DOE Joint Genome Institute. Other aspects of the research were funded by the German Research Foundation, the Austrian Science Foundation, INTAS, the Wellcome Trust, the British Society for Antimicrobial Chemotherapy, and Science Foundation Ireland.

Adapted from materials provided by [DOE/Brookhaven National Laboratory](http://www.doe.gov).

<http://www.sciencedaily.com/releases/2009/06/090616103311.htm>

Individual Primates Display Variation In General Intelligence



Two cotton top tamarin monkeys. Researchers found that intelligence varies among individual cotton top tamarin monkeys. (Credit: iStockphoto/Jeryl Tan)

ScienceDaily (June 17, 2009) — Scientists at Harvard University have shown, for the first time, that intelligence varies among individual monkeys within a species – in this case, the cotton-top tamarin.

Testing for broad cognitive ability, the researchers identified high, middle, and low performing monkeys, determined by a general intelligence score. General intelligence, or "g," is a hallmark of human cognition, often described as similar to IQ. The effect of "g" in primates may offer insight into the evolution of human general intelligence.

The study, published in the journal *PLoS One*, is the first to examine differences of broad cognitive ability in primates within a single species. Previous studies of general intelligence in primates primarily concerned variation between species.

The research was led by Konika Banerjee, a research assistant in the Department of Psychology at Harvard University. Banerjee's co-authors are Marc Hauser, professor of psychology, and James J. Lee all of Harvard, along with Christopher Chabris of Union College, Fritz Tsao of Hillsdale College, and Valen Johnson of the University of Texas Medical School at Houston.

"We found that there was substantial individual variation in performance on these tasks," says Banerjee. "A significant proportion of that variation can actually be accounted for by something that looks very similar to the general intelligence, or 'g' factor, in humans. It appears to be the case that tamarins have something very similar to our general intelligence."

General intelligence, or "g," refers to the positive correlation of an individual's performance on various subtasks within an intelligence test. Banerjee and her colleagues found that "g" accounted for 20 percent of the monkeys' performance on the tasks in the study. The remaining 80 percent of the variation in performance was due to task-specific or environmental circumstances in testing the monkeys.

While not a direct comparison, human "g" accounts for 40 to 60 percent of the variation in an individual's performance on the various subtasks of an IQ test. It may be that an increase in the magnitude of "g" was integral to the evolution of the human brain.

"General intelligence is an important component of human intelligence, but it is also possible that it relies upon ancient neural substrates," says Banerjee. "If different primate taxa differ in the magnitude of 'g,' with humans standing out from the rest of the pack, this might help explain how we, uniquely, can combine thoughts from different domains of knowledge to create new representations of the world. This cognitive domain general ability, captured by 'g,' is something that you might see to varying degrees in other primate taxa."

This study was conducted among 22 cotton-top tamarins, who were administered 11 unique tasks designed to assess different cognitive functions including working memory, executive control, information processing speed, and inhibitory control. For some tasks, the monkeys' goal was to obtain a piece of food, but this was not the case for all of the tasks. Monkeys with higher "g" scores tended to outperform monkeys with lower scores across the various subtasks in the cognitive task battery.

This particular set of tasks was developed for this study, but Banerjee hopes that it or other similar task batteries might be applied to future studies of primate general intelligence, to develop a standardized test for cognitive ability that could be administered to many species.

"We called our cognitive task battery the 'monkey IQ test' very crudely," says Banerjee. "It's a fun way to think about it, but to be more accurate, I would say that we are looking at global cognitive ability across an array of tasks that span multiple cognitive domains."

The research was funded by the Harvard College Research Program and the Goelet Fund to Banerjee, and from grants to Hauser from the McDonnell Foundation and NSF.

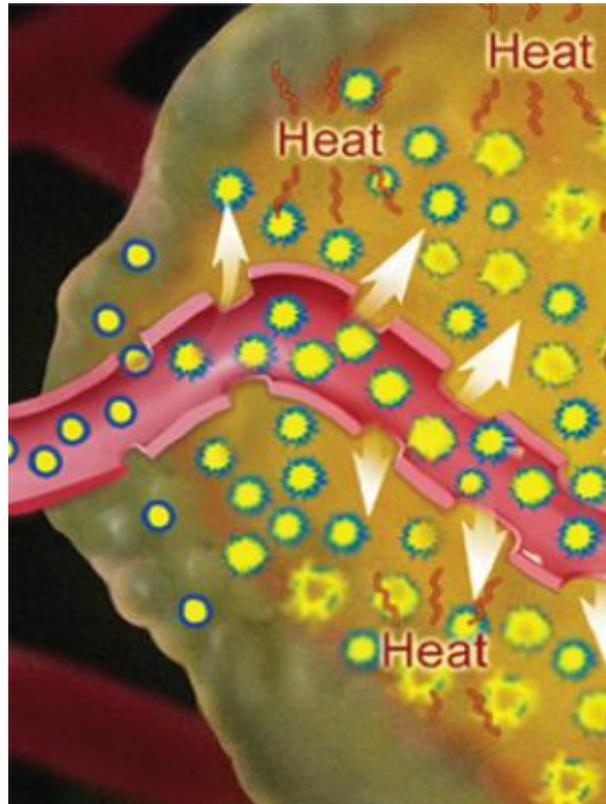
Journal reference:

1. Konika Banerjee et al. **General Intelligence in Another Primate: Individual Differences across Cognitive Task Performance in a New World Monkey (*Saguinus oedipus*)**. *PLoS One*, 4(6): e5883 DOI: [10.1371/journal.pone.0005883](https://doi.org/10.1371/journal.pone.0005883)

Adapted from materials provided by [Harvard University](http://www.harvard.edu), via [EurekAlert!](http://www.eurekalert.com), a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090616205508.htm>

Potential For Non-invasive Brain Tumor Treatment



Heat created by ultrasound melts fatty capsules, releasing cancer-killing drugs on site. (Credit: David Needham, Pratt School of Engineering)

ScienceDaily (June 17, 2009) — Duke University engineers have taken a first step toward a minimally invasive treatment of brain tumors by combining chemotherapy with heat administered from the end of a catheter.

The proof-of-concept study demonstrated that it should be technically possible to treat brain tumors without the side effects associated with the traditional approaches of surgery, systemic chemotherapy or radiation.

The bioengineers designed and built an ultrasound catheter that can fit into large blood vessels of the brain and perform two essential functions: provide real-time moving 3-D images and generate localized temperature increases. The researchers envision using this system in conjunction with chemotherapy drugs encased in heat-sensitive microbubbles called liposomes.

"Physicians would inject drug-carrying liposomes into a patient's bloodstream, and then insert a catheter via a blood vessel to the site of the brain tumor," said Carl Herickhoff, fourth-year graduate student at Duke's Pratt School of Engineering and first author of a paper appearing in the journal *Ultrasonic Imaging*. "The catheter would use ultrasound to first image the tumor, and then direct a higher-power beam to generate heat at the site, melting the liposome shells and releasing the chemotherapy directly to the tumor.

"The temperature increase would be about four degrees Celsius – enough to melt the liposome, but not enough to damage surrounding tissue," Herickhoff said. "No one has tried this approach before in the brain."

The American Cancer Society estimates that more than 21,000 new brain tumor cases were diagnosed in 2008, with more than 13,000 patients dying. This represents about two percent of all cancer deaths.

The researchers said that a minimally invasive approach to treating this cancer would be preferable to the conventional methods, which have drawbacks and side effects of their own.

"Surgery is invasive, and chemotherapy that is injected or taken orally affects the whole body and has difficulty crossing the blood-brain barrier in sufficient concentrations," Herickhoff said. The blood-brain barrier restricts the passage into the brain of any foreign matter not needed by the neural tissue.

In a series of experiments in animal models and simulated tissues, the researchers demonstrated that they could build a catheter thin enough to be placed in one of the brain's main blood vessels that was capable of serving the dual purpose of visualization and heating.

"Taken as a whole, the results of these experiments, in particular the clarity of the images and ability to increase temperature with the same catheter, lead us to believe that the ultimate creation of a practical intracranial ultrasound catheter is possible," said Stephen Smith, director of the Duke University Ultrasound Transducer Group and senior member of the research team. "There are some design issues of the catheter itself that we feel can be overcome with little difficulty."

Advances in ultrasound technology have made these latest experiments possible, the researchers said, by generating detailed, 3-D moving images in real-time. The Duke laboratory has a long track record of modifying traditional 2-D ultrasound – like that used to image babies in utero – into the more advanced 3-D scans. After inventing the technique in 1991, the team also has shown its utility in developing specialized catheters and endoscopes for real-time imaging of tissues throughout the body.

Much of the liposome research was carried out at Duke by David Needham, professor of mechanical engineering and materials science, and Mark Dewhirst, professor of radiation oncology.

The research in Smith's lab is supported by the National Institutes of Health. Other members of the team, also from Duke, are Edward Light, Kristin Bing, Srinivasan Mukundan, Gerald Grant and Patrick Wolf.

Adapted from materials provided by Duke University.

<http://www.sciencedaily.com/releases/2009/06/090616103309.htm>

Normal Development Of Cells With Abnormal Numbers Of Nuclei

ScienceDaily (June 17, 2009) — Most of our cells contain a single nucleus that harbors 46 chromosomes (DNA and protein complexes that contain our genes). However, during normal postnatal development, liver cells containing two nuclei, each of which have 46 chromosomes, appear.

These cells, which are known as binucleated tetraploid hepatocytes, arise in all mammals as a result of failure of the cellular process cytokinesis (the process by which the bulk of a cell, excluding the nucleus, divides to form two "daughter" cells). New insight into the failure of this process has now been provided by Chantal Desdouets and colleagues, at Institut Cochin, France, who have identified a cellular signaling pathway that leads to cytokinesis failure and the formation of binucleated tetraploid hepatocytes in rodents.

Initial analysis revealed that weaning triggered the initiation of cytokinesis failure and formation of binucleated tetraploid hepatocytes in rats. Follow up studies in mice and rats indicated that the aspect of the suckling-to-weaning transition that controls the initiation of cytokinesis failure is the increase in insulin levels that occurs upon weaning.

Further in vitro analysis, using pharmacological inhibitors, determined the signaling pathway by which insulin controlled cytokinesis failure.

Future studies will investigate whether the deregulation of the insulin signaling pathway observed in various metabolic diseases alters the number of binucleated tetraploid hepatocytes in the liver ploidy profile and whether this has a role in disease.

Journal reference:

1. Celton-Morizur et al. **The insulin/Akt pathway controls a specific cell division program that leads to generation of binucleated tetraploid liver cells in rodents.** *Journal of Clinical Investigation*, 2009; DOI: [10.1172/JCI38677](https://doi.org/10.1172/JCI38677)

Adapted from materials provided by *Journal of Clinical Investigation*, via *EurekAlert!*, a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090615171511.htm>

Wrong Type Of Help From Parents Could Worsen Child's Obsessive-compulsive Disorder

ScienceDaily (June 17, 2009) — For most parents, soothing a child's anxiety is just part of the job. But for a parent whose child has obsessive-compulsive disorder, soothing anxiety and helping with behaviors linked to the disease could lead to more severe symptoms, University of Florida researchers say. Often, parents of children with OCD will help their children complete rituals related to their obsessions and compulsions, such as excessive bathing or checking things like door locks, according to findings recently published in the *Journal of Consulting and Clinical Psychology*. These accommodations can be anything that makes the symptoms of OCD less impairing, from reassuring a child that his hands are clean and his baby brother is OK to even doing his homework for him or buying objects that make the child feel safe.

"Parents do that because that is what a parent whose child doesn't have OCD would do," said Lisa Merlo, Ph.D., a UF assistant professor of psychiatry and the lead author of the study. "If your child is upset, you try to comfort them. But what we know is, for patients with OCD, if they get an accommodation, that reinforces the OCD to them." "It's validating the OCD in the kid's mind, and that's what you don't want to do."

About one in 200 children and teenagers in the United States have OCD, according to the American Academy of Child & Adolescent Psychiatry. The study included 49 children between 6 and 18 with OCD and their families who came to UF for a type of treatment called cognitive-behavioral therapy. This form of therapy involves exposing children to their fears and teaching them better ways to respond and cope. During the sessions, therapists teach parents how they should deal with their child's OCD, too.

Prior to the start of the 14-session therapy, the researchers gauged how severe each child's condition was and compared it to how many accommodating behaviors parents reported. They found that the more severe the child's OCD, the more the child's family seemed to accommodate OCD behaviors.

"You would think if parents are helping, the kids would be less impaired," Merlo said. "But what we are seeing is that it snowballs and makes it worse and worse." After the treatment, researchers noticed a significant decrease in how often families were assisting children with OCD behaviors and rituals. Children whose families had the biggest decrease in these accommodations also had the biggest improvement in their OCD symptoms, Merlo said.

What researchers don't yet know is if a family's "help" causes a child's OCD to worsen or if the severity of the disease causes parents to try to do more to help their children. Some children, including many who come to UF's clinic, have symptoms so severe it prevents them from playing with friends or even going to school, Merlo said. In these instances, parents often feel they have to do whatever they can to help their children function, from doing their homework for them to buying specific items they feel like they need.

"If a kid is struggling a lot, parents feel like they have to do a lot to get through the day," Merlo said. "But if the child is not experiencing the natural consequences of the OCD symptoms, then they don't have any motivation to stop." This phenomenon isn't exclusive to children and parents, said Jonathan S. Abramowitz, Ph.D., an associate professor and associate chairman of psychology at the University of North Carolina at Chapel Hill. "We see it with adults' spouses and partners, too. In trying to be helpful to the person with OCD, they end up making the problem worse." Although therapists have noticed this phenomenon anecdotally, there has so far been little research evidence to prove it. UF's study will help therapists and scientists address the problem, he said.

"It is very nice to have research data to back up these clinical observations," he said.

Adapted from materials provided by [University of Florida](http://www.universityofflorida.edu).

<http://www.sciencedaily.com/releases/2009/06/090617123658.htm>

New Nanoparticles Could Lead To End Of Chemotherapy



Dr. Manuel Perez and his team have been investigating the use of nanoparticles for medicine for years. (Credit: Jacque Brund)

ScienceDaily (June 17, 2009) — Nanoparticles specially engineered by University of Central Florida Assistant Professor J. Manuel Perez and his colleagues could someday target and destroy tumors, sparing patients from toxic, whole-body chemotherapies.

Perez and his team used a drug called Taxol for their cell culture studies, recently published in the journal *Small*, because it is one of the most widely used chemotherapeutic drugs. Taxol normally causes many negative side effects because it travels throughout the body and damages healthy tissue as well as cancer cells.

The Taxol-carrying nanoparticles engineered in Perez's laboratory are modified so they carry the drug only to the cancer cells, allowing targeted cancer treatment without harming healthy cells. This is achieved by attaching a vitamin (folic acid) derivative that cancer cells like to consume in high amounts.

Because the nanoparticles also carry a fluorescent dye and an iron oxide magnetic core, their locations within the cells and the body can be seen by optical imaging and magnetic resonance imaging (MRI). That allows a physician to see how the tumor is responding to the treatment.

The nanoparticles also can be engineered without the drug and used as imaging (contrast) agents for cancer. If there is no cancer, the biodegradable nanoparticles will not bind to the tissue and will be eliminated by the liver. The iron oxide core will be utilized as regular iron in the body.

"What's unique about our work is that the nanoparticle has a dual role, as a diagnostic and therapeutic agent in a biodegradable and biocompatible vehicle," Perez said.

Perez has spent the past five years looking at ways nanotechnology can be used to help diagnose, image and treat cancer and infectious diseases. It's part of the quickly evolving world of nanomedicine.



The process works like this. Cancer cells in the tumor connect with the engineered nanoparticles via cell receptors that can be regarded as "doors" or "docking stations." The nanoparticles enter the cell and release their cargo of iron oxide, fluorescent dye and drugs, allowing dual imaging and treatment.

"Although the results from the cell cultures are preliminary, they are very encouraging," Perez said.

A new chemistry called "click chemistry" was utilized to attach the targeting molecule (folic acid) to the nanoparticles. This chemistry allows for the easy and specific attachment of molecules to nanoparticles without unwanted side products. It also allows for the easy attachment of other molecules to nanoparticles to specifically seek out particular tumors and other malignancies.

Perez's study builds on his prior research published in the prestigious journal *Angewandte Chemie Int. Ed.* His work has been partially funded by a National Institutes of Health grant and a Nanoscience Technology Center start-up fund.

"Our work is an important beginning, because it demonstrates an avenue for using nanotechnology not only to diagnose but also to treat cancer, potentially at an early stage," Perez said.

Perez, a Puerto Rico native, joined UCF in 2005. He works at UCF's NanoScience Technology Center and Chemistry Department and in the Burnett School of Biomedical Sciences in the College of Medicine. He has a Ph.D. from Boston University in Biochemistry and completed postdoctoral training at Massachusetts General Hospital, Harvard Medical School's teaching and research hospital.

Adapted from materials provided by [University of Central Florida](http://www.sciencedaily.com/releases/2009/06/090616121343.htm).

<http://www.sciencedaily.com/releases/2009/06/090616121343.htm>

Ancient Ice Age, Once Regarded As Brief 'Blip' Found To Have Lasted For 30 Million Years

ScienceDaily (June 17, 2009) — Geologists at the University of Leicester have shown that an ancient Ice Age, once regarded as a brief 'blip', in fact lasted for 30 million years.

Their research suggests that during this ancient Ice Age, global warming was curbed through the burial of organic carbon that eventually lead to the formation of oil – including the 'hot shales' of north Africa and Arabia which constitute the world's most productive oil source rock. This ice age has been named 'the Early Palaeozoic Icehouse' by Dr Alex Page and his colleagues in a paper published as part of a collaborative Deep Time Climate project between the University of Leicester and British Geological Survey.

The Ice Age occurred in the Ordovician and Silurian Periods of geological time (part of the Early Palaeozoic Era), an interval that witnessed a major diversification of early marine animals including trilobites and primitive fish as well as the emergence of the first land plants. The Early Palaeozoic climate had long been considered characterised by essentially greenhouse conditions with elevated atmospheric CO₂ and warm temperatures extending to high latitudes, and only brief snaps of frigid climate. However, during his doctoral studies in the internationally renowned Palaeobiology Research Group of the University of Leicester, Department of Geology, Alex Page and his colleagues Jan Zalasiewicz and Mark Williams demonstrated how the ice age was probably of much longer duration.

The team demonstrated that the Late Ordovician and Early Silurian Epochs were characterised by widespread ice formation, with changes in the extent of continental glaciation resulting in rapid sea-level changes around the globe. They compared evidence of sea-level change from the rock record of ancient coastlines with evidence of sediments being deposited by glacial meltwaters or ice-rafting at high latitudes, and with chemical indicators of temperature in the strata.

The team showed that although the Early Palaeozoic Icehouse was of similar extent and duration to the modern ice age, the workings of the carbon cycle appeared markedly different to that of the present day. Unlike the modern oceans, the oceans of the Early Palaeozoic were often oxygen-starved 'dead zones' leading to the burial of plankton-derived carbon in the sea floor sediments. The strata produced in this way include the 'hot shales' of north Africa and Arabia which constitute the world's most productive oil source rock. In fact, the burial of organic carbon derived from fossil plankton may have served to draw down CO₂ from the atmosphere to promote cooling during the Early Palaeozoic Icehouse.

Page commented: "These fossil fuel- rich deposits formed during relatively warmer episodes during the Early Palaeozoic Icehouse when the partial melting of ice sheets brought about rapid sea-level rise. This melt-water may have bought a massive influx of nutrients into the surface waters, allowing animals and algae to thrive and bloom in the plankton, but also altered ocean circulation, creating oxygen-poor deep waters which facilitated the preservation of fragile, carbonaceous planktonic fossils. The deglacial outwash formed a less dense, low-salinity 'lid' on the oceans preventing atmospheric oxygen penetrating to the seafloor. The absence of oxygen under such conditions served to shut down decay accounting for the preservation of these fossils." Page added that the burial of oil shales in deglacial anoxia "may have been a negative feedback mechanism that prevented runaway warming, meaning that in the Early Palaeozoic Icehouse at least, processes eventually leading to oil formation may have been the solution to the greenhouse effect."

Alex Page's research will be presented at the Doctoral Inaugural Lectures being held at the University of Leicester. on June 17. They have also published their findings.

Adapted from materials provided by [University of Leicester](http://www.universityofleicester.ac.uk).

<http://www.sciencedaily.com/releases/2009/06/090616103307.htm>

Sands Of Gobi Desert Yield New Species Of Nut-cracking Dinosaur

Artistic rendering of a newly discovered species of parrot-beaked dinosaur, *Psittacosaurus gobiensis*. Scientists first discovered psittacosaurus in the Gobi Desert in 1922, calling them "parrot-beaked" for their resemblance to parrots. Psittacosaurus evolved their strong-jawed, nut-eating habits 60 million years before the earliest parrot. (Credit: Todd Marshall)



ScienceDaily (June 17, 2009) — Plants or meat: That's about all that fossils ever tell paleontologists about a dinosaur's diet. But the skull characteristics of a new species of parrot-beaked dinosaur and its associated gizzard stones indicate that the animal fed on nuts and/or seeds. These characteristics present the first solid evidence of nut-eating in any

dinosaur. "The parallels in the skull to that in parrots, the descendants of dinosaurs most famous for their nut-cracking habits, is remarkable," said Paul Sereno, a paleontologist at the University of Chicago and National Geographic Explorer-in-Residence. Sereno and two colleagues from the People's Republic of China announce their discovery June 17 in the *Proceedings of the Royal Society B*.

The paleontologists discovered the new dinosaur, which they've named *Psittacosaurus gobiensis*, in the Gobi Desert of Inner Mongolia in 2001, and spent years preparing and studying the specimen. The dinosaur is approximately 110 million years old, dating to the mid-Cretaceous Period. The quantity and size of gizzard stones in birds correlates with dietary preference. Larger, more numerous gizzard stones point to a diet of harder food, such as nuts and seeds. "The psittacosaur at hand has a huge pile of stomach stones, more than 50, to grind away at whatever it eats, and this is totally out of proportion to its three-foot body length," Sereno explained.

Technically speaking, the dinosaur is also important because it displays a whole new way of chewing, which Sereno and co-authors have dubbed "inclined-angle" chewing. "The jaws are drawn backward and upward instead of just closing or moving fore and aft," Sereno said. "It remains to be seen whether some other plant-eating dinosaurs or other reptiles had the same mechanism."

The unusual chewing style has solved a major mystery regarding the wear patterns on psittacosaur teeth. Psittacosaurus sported rigid skulls, but their teeth show the same sliding wear patterns as plant-eating dinosaurs with flexible skulls. Funding sources: National Geographic Society; David and Lucile Packard Foundation; Biological Sciences Division, University of Chicago; and the Long Hao Institute of Stratigraphic Paleontology

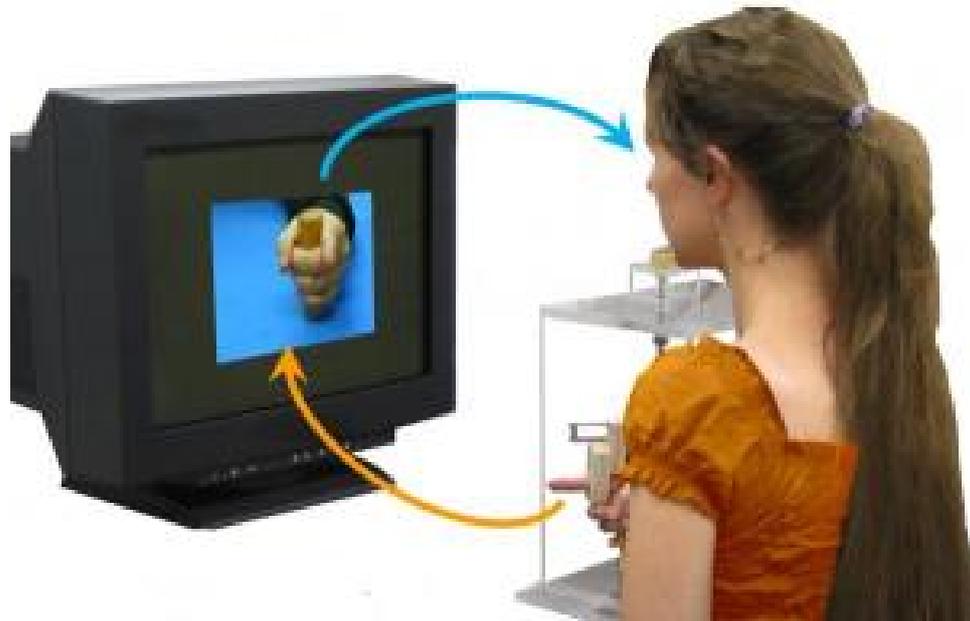
Journal reference:

1. Paul A. Sereno et al. **A new psittacosaur from Inner Mongolia and the parrot-like structure and function of the psittacosaur skull.** *Proceedings of the Royal Society B*, June 17, 2009
2. **and function of the psittacosaur skull.** *Proceedings of the Royal Society B*, June 17, 2009

Adapted from materials provided by [University of Chicago](http://www.universityofchicago.edu), via [EurekAlert!](http://www.eurekalert.com), a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090617104905.htm>

Hybrid System Of Human-Machine Interaction Created



Scientists have created a "hybrid" system to examine real-time interactions between humans and machines (virtual partners). By pitting human against machine, they open up the possibility of exploring and understanding a wide variety of interactions between minds and machines. (Credit: Image courtesy of Florida Atlantic University)

ScienceDaily (June 17, 2009) — Scientists at FAU have created a "hybrid" system to examine real-time interactions between humans and machines (virtual partners). By pitting human against machine, they open up the possibility of exploring and understanding a wide variety of interactions between minds and machines, and establishing the first step toward a much friendlier union of man and machine, and perhaps even creating a different kind of machine altogether. For more than 25 years, scientists in the Center for Complex Systems and Brain Sciences (CCSBS) in Florida Atlantic University's Charles E. Schmidt College of Science, and others around the world, have been trying to decipher the laws of coordinated behavior called "coordination dynamics".

Unlike the laws of motion of physical bodies, the equations of coordination dynamics describe how the coordination states of a system evolve over time, as observed through special quantities called collective variables. These collective variables typically span the interaction of organism and environment. Imagine a machine whose behavior is based on the very equations that are supposed to govern human coordination. Then imagine a human interacting with such a machine whereby the human can modify the behavior of the machine and the machine can modify the behavior of the human. In a groundbreaking study published in the June 3 issue of PLoS One and titled "Virtual Partner Interaction (VPI): exploring novel behaviors via coordination dynamics," an interdisciplinary group of scientists in the CCSBS created VPI, a hybrid system of a human interacting with a machine. These scientists placed the equations of human coordination dynamics into the machine and studied real-time interactions between the human and virtual partners. Their findings open up the possibility of exploring and understanding a wide variety of interactions between minds and machines. VPI may be the first step toward establishing a much friendlier union of man and machine, and perhaps even creating a different kind of machine altogether.

"With VPI, a human and a 'virtual partner' are reciprocally coupled in real-time," said Dr. J. A. Scott Kelso, the Glenwood and Martha Creech Eminent Scholar in Science at FAU and the lead author of the study. "The human acquires information about his partner's behavior through perception, and the virtual partner continuously detects the human's behavior through the input of sensors. Our approach is analogous to the dynamic clamp used to study the dynamics of interactions between neurons, but now

scaled up to the level of behaving humans.” In this first ever study of VPI, machine and human behaviors were chosen to be quite simple. Both partners were tasked to coordinate finger movements with one another. The human executed the task with the intention of performing in-phase coordination with the machine, thereby trying to synchronize his/her flexion and extension movements with those of the virtual partner’s. The machine, on the other hand, executed the task with the competing goal of performing anti-phase coordination with the human, thereby trying to extend its finger when the human flexed and vice versa. Pitting machine against human through opposing task demands was a way the scientists chose to enhance the formation of emergent behavior, and also allowed them to examine each partner’s individual contribution to the coupled behavior. An intriguing outcome of the experiments was that human subjects ascribed intentions to the machine, reporting that it was “messing” with them.

“The symmetry between the human and the machine, and the fact that they carry the same laws of coordination dynamics, is a key to this novel scientific framework,” said co-author Dr. Gonzalo de Guzman, a physicist and research associate professor at the FAU center. “The design of the virtual partner mirrors the equations of motion of the human neurobehavioral system. The laws obtained from accumulated studies describe how the parts of the human body and brain self-organize, and address the issue of self-reference, a condition leading to complexity.”

One ready application of VPI is the study of the dynamics of complex brain processes such as those involved in social behavior. The extended parameter range opens up the possibility of systematically driving functional process of the brain (neuromarkers) to better understand their roles. The scientists in this study anticipate that just as many human skills are acquired by observing other human beings; human and machine will learn novel patterns of behavior by interacting with each other.

“Interactions with ever proliferating technological devices often place high skill demands on users who have little time to develop these skills,” said Kelso. “The opportunity presented through VPI is that equally useful and informative new behaviors may be uncovered despite the built-in asymmetry of the human-machine interaction.”

While stable and intermittent coordination behaviors emerged that had previously been observed in ordinary human social interactions, the scientists also discovered novel behaviors or strategies that have never previously been observed in human social behavior. The emergence of such novel behaviors demonstrates the scientific potential of the VPI human-machine framework.

Modifying the dynamics of the virtual partner with the purpose of inducing a desired human behavior, such as learning a new skill or as a tool for therapy and rehabilitation, are among several applications of VPI.

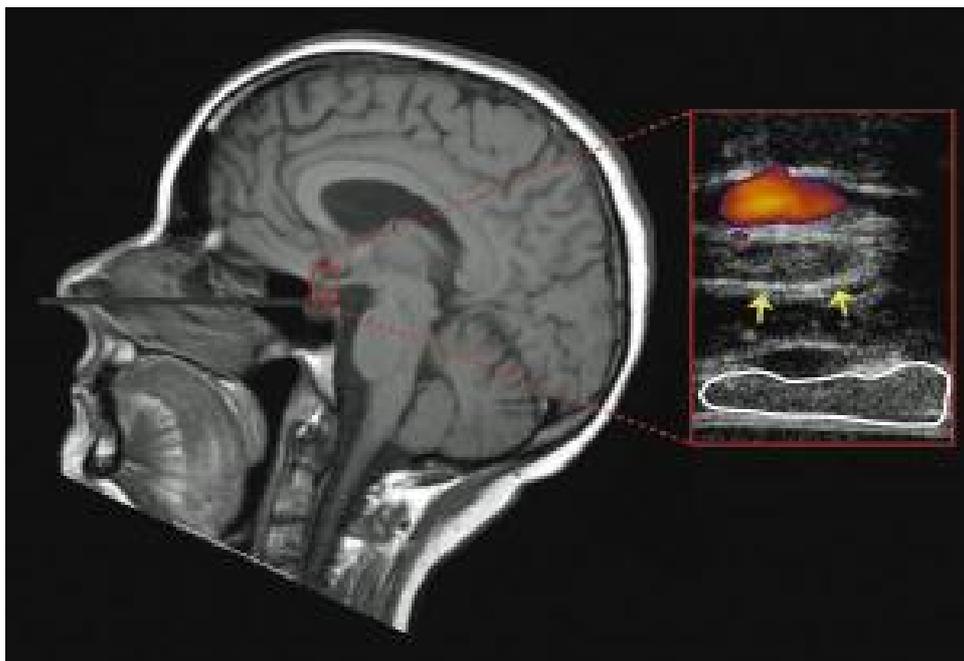
“The integration of complexity in to the behavioral and neural sciences has just begun,” said Dr. Emmanuelle Tognoli, research assistant professor in FAU’s CCSBS and co-author of the study. “VPI is a move away from simple protocols in which systems are ‘poked’ by virtue of ‘stimuli’ to understanding more complex, reciprocally connected systems where meaningful interactions occur.”

Research for this study was supported by the National Science Foundation program “Human and Social Dynamics,” the National Institute of Mental Health’s “Innovations Award,” “Basic and Translational Research Opportunities in the Social Neuroscience of Mental Health,” and the Office of Naval Research Code 30. Kelso’s research is also supported by the Pierre de Fermat Chaire d’Excellence and Tognoli’s research is supported by the Davimos Family Endowment for Excellence in Science.

Adapted from materials provided by Florida Atlantic University, via Newswise.

<http://www.sciencedaily.com/releases/2009/06/090616193908.htm>

Ultrasonics Improves Surgeons' View When Removing Tumors From The Pituitary Gland



Ultrasonics: Operating on the pituitary involves leading an ultrasonic instrument in through the nose. On the ultrasonic image: remaining tumour tissue (white outline), route of the visual nerve (yellow arrows) and blood-flow in an artery (orange and lilac). (Credit: Image courtesy of SINTEF)

ScienceDaily (June 17, 2009) — Ultrasonics improves surgeons' view when they remove tumours from the pituitary gland.

Hidden in a little hollow in the skull, at about the level of the eye, we have a gland about the size of a blackcurrant. This is the hypophysis, or pituitary, the body's centre for hormone manufacture. The gland produces a wide range of hormones which in turn control other organs that manufacture yet more hormones.

Every year, some 120 Norwegian patients are operated for tumours in the pituitary gland. Now SINTEF, NTNU and St. Olav's Hospital in Trondheim have joined forces to develop an ultrasonic instrument that give Trondheim's neurosurgeons an extra "eye" during interventions of this sort.

Promising method

Assistant physician and Doctoral student Ole Solheim describes the new operation aid as very promising.

"We are probably able to remove more tumour tissue than we would have been able to do otherwise, which reduces the chances of the tumour returning, and increases the likelihood of obtaining a nearly normal hormonal balance. The instrument also makes it easier to see where the tumour cells lie relative to the visual nerves and blood vessels – structures close to the pituitary that we must avoid damaging during the operation."

For the moment, use of the new instrument has the status of an experimental treatment. The new "window" on the inside of the skull has been used on 15 patients at St. Olav's Hospital.

In earlier days, people afflicted with pituitary tumours might well end up in circus freak-shows, because the cocktail of compounds that are produced by the pituitary includes growth hormones. Certain pituitary



tumours may produce abnormal patterns of growth before the body is fully grown. If the illness develops later in life, it can result in a very heavy body shape, and in the worst cases, a lethal stress on the patient's heart. Tumours may also cause pressure on other brain tissue and produce damage there.

More study needed

Solheim emphasises that large-scale comparative studies of operations on pituitary tumour patients are needed before the value of the ultrasonic instrument can be documented. However, he points out that even the best aids can never guarantee that an operation will not lead to complications.

In the development of the instrument, SINTEF's Tormod Selbekk, and Lasse Løvstakken and Tonni Johansen of NTNU were the main contributors on the technology side.

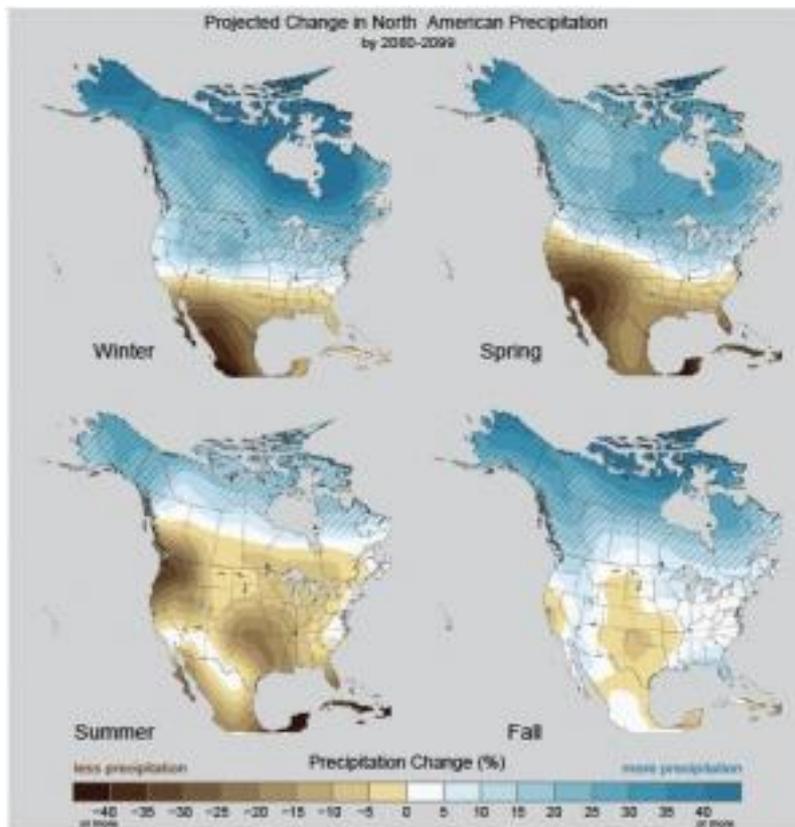
The 3D Ultrasound Centre of Expertise, the Research Council of Norway and the mid-Norway Regional Health Authority have all helped to finance the development of the new surgical aid. SINTEF, NTNU and St. Olav's Hospital have joined forces with the Norwegian company Sonowand to continue development of the instrument.

Adapted from materials provided by SINTEF, via AlphaGalileo.

<http://www.sciencedaily.com/releases/2009/06/090608143701.htm>



Climate Change Already Having Impact On U.S., Expected To Worsen



Precipitation map developed by Berkeley Lab's Michael Wehner shows, among other things, a substantial reduction in springtime rains in California, and summertime rains in the Pacific Northwest. (Credit: Image courtesy of DOE/Lawrence Berkeley National Laboratory)

ScienceDaily (June 17, 2009) — Extreme weather, drought, heavy rainfall and increasing temperatures are a fact of life in many parts of the US as a result of human-induced climate change, researchers report. These and other changes will continue and likely increase in intensity into the future, the scientists found. For the southwest region of the United States, which includes California, the report forecasts a hotter, drier climate with significant effects on the environment, agriculture and health.

Researchers representing 13 U.S. government science agencies, major universities and research institutes produced the major report entitled "Global Climate Change Impacts in the United States." Two researchers at the U.S. Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab), Evan Mills and Michael Wehner, contributed to the analysis in the study, released June 16 by the multi-agency U.S. Global Change Research Program.

For the southwest region of the United States, which includes California, the report forecasts a hotter, drier climate with significant effects on the environment, agriculture and health.

"Global Climate Change Impacts in the United States" covers such effects as changes in rainfall patterns, drought, wildfire, Atlantic hurricanes, and effects on food production, fish stocks and other wildlife, energy, agriculture, water supplies, and coastal communities.

"This is the most thorough and up-to-date review ever assembled of climate-change impacts observed to date as well as those anticipated in the future across the United States," says Evan Mills, one of the

Berkeley Lab scientists who contributed to the report. While the report paints an ominous picture of potential impacts, “the good news is that the harshest impacts of future climate change can be avoided if the nation takes deliberate action soon. This can be done through a balanced mix of activities to reduce greenhouse-gas emissions and adaptation to the otherwise unavoidable impacts,” says Mills.

The report addresses nine zones of the United States (Southwest, Northwest, Great Plains, Midwest, Southeast, Northeast, Alaska, U.S. islands, and coasts), and describes potential climate change effects in each. California is part of the southwest zone, as well as a coastal zone.

Wehner, who is a climate researcher in the Scientific Computing Group of Berkeley Lab’s Computational Research Division, developed projections of future climate change for the report chapters covering global and national impacts of climate change. One of Wehner’s research interests is extreme weather conditions resulting from climate change.

The precipitation map shown is one of the projections developed by Wehner. It shows, among other things, a substantial reduction in springtime rains in California, and summertime rains in the Pacific Northwest.

“Even in areas where precipitation is projected to increase, higher temperatures will cause greater evaporation leading to a future where drought conditions are the normal state. In the southwest United States, water resource issues will become a major issue,” says Wehner.

Another of Wehner’s graphics shows past and future projections of the global mean surface air temperature, an indicator of the magnitude of the effects of global climate change. The three different trajectories after 2009 show low emissions, and two high emissions scenarios of how the temperature increase caused by greenhouse gas emissions could play out. The projections are based on the most sophisticated climate models available.

“These and similar projections reveal that actions taken today would take several decades to make any noticeable change in the rate of warming. This is one of the factors that makes climate change a difficult policy issue. There is no instant gratification,” says Wehner.

Mills, who studies climate change and the insurance industry in the Environmental Energy Technologies Division of Berkeley Lab, worked on the report’s sections addressing impacts on society and on the energy sector. The insurance industry has been one of the early responders to the threats posed by climate change, because the industry has been a leader in preventive education against catastrophes such as fire and windstorm hazards. Extreme weather conditions, and the resulting damage, will probably impact the industry’s bottom line, possibly severely, as well as that of government provided insurance programs for floods and crops.

“Insurance is one of the industries particularly vulnerable to increasing extreme weather events such as severe storms, but it also is beginning to help society manage the risks,” says Mills. “Insurance, the world’s largest industry, will be one of the primary mechanisms through which the costs of climate change are distributed across society. Some insurers are emerging as partners in climate science and the formulation of public policy and adaptation strategies. Others have recognized that mitigation and adaptation can work hand in hand in a coordinated climate risk-management strategy and are offering “green” insurance products designed to capture these dual benefits.”

A Drier California

Decline in precipitation and water supplies will likely be one of the most prominent effects of climate change in California and other states of the southwest (Nevada, Arizona, Utah, Colorado, and New Mexico). The report suggests that runoff will decline from 10 to 40 percent in 2040 to 2060 relative to the 1901-1970 baseline, and warns that scarce water supplies will call for trade-offs among competing uses.

“Floods and droughts are likely to become much more common and intense as regional and seasonal precipitation patterns change and rainfall is more concentrated into heavy events with longer dry periods in between,” it states.

There will likely be less snow, with more winter precipitation falling as rain, and the wet areas will get wetter as dry areas get dryer. The region will likely see declines in the mountain snowpack, and runoff will shift to earlier in spring, reducing water flows later in the year in the summer. California is strongly dependent on spring and summer runoff to supply water for residential, commercial and agricultural uses.

Agriculture in California will likely face increasing stress from the decline in runoff and drought, as well as increasing air temperatures, and the probable rise in agricultural pests and weeds expected in a warmer climate. Flooding and storm surges are threats to coastal regions.

Forest growth in the west will decrease because of the decreasing availability of water. This will also put additional stress on salmon, trout and other coldwater fish. Superinfestations of insects will cause ecological and economic damages to timberlands.

A Hotter California

Increasing air temperatures attributed to global warming are expected to cause a rise in the number of heat-related illnesses in the 2080 to 2099 timeframe. In parts of southern California, the state’s southern Central Valley, and western Arizona, for instance, the number of days in which the temperature exceeds 100°F could exceed 120 under the report’s higher emissions scenario.

Changes in the nation’s population and distribution could combine to amplify the probability of increasing heat-related disease. As the nation ages, its older members move to warmer areas of the country including the desert southwest.

Another effect of these higher temperatures will be increased energy demand. The report predicts “increases in demand for cooling energy” in California as well as elsewhere, which will result in “significant increases in electricity use and higher peak demand in most regions.” Mills contributed analysis to the report of the strongly rising role of extreme weather events in causing electric power disruptions, while non-weather-related events show no upward trend.

The full report, “Global Climate Change Impacts in the United States” is available at:
<http://www.globalchange.gov/usimpacts>

Adapted from materials provided by [DOE/Lawrence Berkeley National Laboratory](http://www.doe.gov).

<http://www.sciencedaily.com/releases/2009/06/090616133944.htm>

Single Gene Found To Control Growth Of Some Cancers

ScienceDaily (June 17, 2009) — Research led by Ashok Aiyar, PhD, Associate Professor of Microbiology at LSU Health Sciences Center New Orleans, showing that a single gene can control growth in cancers related to the Epstein-Barr virus and that existing therapeutics can inactivate it, will be published in the June 12, 2009 online issue of *PLoS Pathogens*.

The Epstein-Barr virus (EBV) is closely associated with many human cancers such as Burkitt's lymphoma, Hodgkin's lymphoma, AIDS-related lymphomas, post-transplant lymphoproliferative disease, cancers of the nose and throat, and stomach cancer. In many of these malignancies, proteins made by EBV are necessary for tumor cells to grow indiscriminately. This is especially true of AIDS-related lymphomas and post-transplant lymphoproliferative disease, which are serious complications of AIDS and transplant surgery. These cancers are responsible for thousands of deaths each year in the United States.

The LSUHSC research team, which also includes Kenneth Johnston, PhD, Professor of Microbiology, and Timothy Foster, PhD, Assistant Professor of Microbiology and faculty of the LSUHSC Gene Therapy Program, investigated a small region of a certain Epstein-Barr virus protein called EBNA1, to determine the role it plays in the activation of the EBV genes responsible for the indiscriminate growth of tumor cells in these cancers. Their research shows that EBNA1 is controlled by oxidative stress (pathologic changes in response to excessive levels of free radicals) within the EBV-infected cells. Varying levels of oxidative stress change EBNA1's ability to activate EBV genes responsible for indiscriminate tumor cell growth.

"We have shown that in vitro, existing therapeutics such as Vitamin K that can change oxidative stress within cells, inactivate EBNA1," notes Dr. Aiyar, who is also a member of the faculty of the LSUHSC Stanley S. Scott Cancer Center. "As a consequence, EBV genes required for proliferation are no longer expressed, and malignantly transformed cells stop proliferating."

The research was funded by grants from the National Cancer Institute, the Louisiana Cancer Research Consortium, and the Department of Microbiology, Immunology, and Parasitology at LSU Health Sciences Center New Orleans School of Medicine.

"It is our hope that this research will lead to new ways of controlling EBV-associated diseases in humans," concludes Dr. Aiyar.

Adapted from materials provided by Louisiana State University Health Sciences Center, via EurekAlert!, a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090612092739.htm>

First Climate-based Model To Predict Dengue Fever Outbreaks



Nelson Mena, an undergraduate student from the University of Costa Rica school of microbiology, is collecting mosquito larvae in Puntarenas, Costa Rica. (Credit: Adriana Troyo and Olger Calderon)

ScienceDaily (June 17, 2009) — Dengue Fever (DF) and Dengue Hemorrhagic Fever (DHF) are the most important vector-borne viral diseases in the World. Around 50-100 million cases appear each year putting 2.5 billion people at risk of suffering this debilitating and sometimes fatal disease. Dengue Fever is prevalent in the Tropics. For that reason, an interdisciplinary team of researchers from the University of Miami (UM) and the University of Costa Rica have used global climatological data and vegetation indices from Costa Rica, to predict Dengue outbreaks in the region.

The new model can predict Dengue Fever epidemics with 83% accuracy, up to 40 weeks in advance of an outbreak and provide information on the magnitude of future epidemics. The model can be expanded to include the broader region of Latin America and the Caribbean, where incidence and spread of the disease has increased dramatically over the past 25 years.

An early warning system to prevent and mitigate the spread of the disease can potentially be developed using this model, explained Douglas O. Fuller, associate professor and chair of the department of Geography and Regional Studies in the UM College of Arts and Sciences and principal investigator of this project.

"Such a tool will provide sufficient time for public health authorities to mobilize resources to step up vector control measures, alert at-risk populations to impending conditions and help health professionals plan for increased case loads," Fuller said.

Vector-borne diseases, such DF and DHF, are ones in which the disease is transmitted from an infected individual to another by a biological agent. In the case of Dengue, one of four closely related Dengue viruses is transmitted to humans by the *Aedes aegypti* or more rarely the *Aedes albopictus* mosquito, sometimes with other animals serving as intermediary hosts. Most of the world's population infected by



Dengue (also known as "breakbone fever") is located in tropical and subtropical areas of the globe, where the weather is dominated by rainfall.

This project looks at climate and vegetation variables that have an impact on the mosquito populations in the American Tropics, such as El Niño Southern Oscillations, sea-surface temperatures and seasonal vegetation dynamics that affect evaporation and humidity near the ground.

"We were surprised that sea-surface temperature variations in the Pacific related to El Niño can be linked to a debilitating disease," Fuller said. "Now we see more clearly that global climate oscillations such as El Niño are important drivers of disease as well"

The study contributes to the rapidly emerging field of climate and infectious disease, which addresses increasing concerns that global warming, will exacerbate certain diseases like Dengue Fever and allow the vectors to spread to more temperate areas. The findings of this study were published earlier this year in the Institute of Physics journal Environmental Research Letters.

The model predicted a major Dengue epidemic of 2005 and has also been tested on data from Trinidad and Singapore with extremely accurate results, Fuller said. Other factors that may contribute to the increased occurrence of Dengue

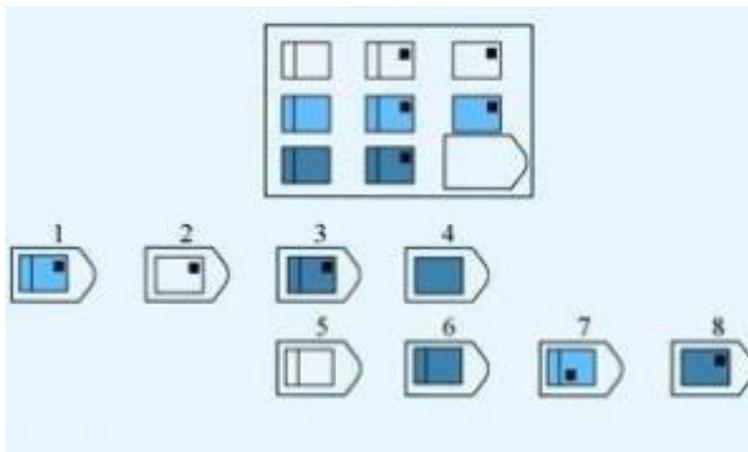
Fever in the Tropics are: global trade, population growth and uncontrolled or unplanned urbanization.

Adapted from materials provided by University of Miami, via EurekAlert!, a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090605171244.htm>

Autistics Better At Problem-solving, Study Finds

Participants were asked to complete patterns in the Raven's Standard Progressive Matrices (RSPM) -- a test that measures hypothesis-testing, problem-solving and learning skills. (Credit: Image courtesy of University of Montreal)



ScienceDaily (June 17, 2009) — Autistics are up to 40 percent faster at problem-solving than non-autistics, according to a new Université de Montréal and Harvard University study

published in the journal *Human Brain Mapping*. As part of the investigation, participants were asked to complete patterns in the Raven's Standard Progressive Matrices (RSPM) – test that measures hypothesis-testing, problem-solving and learning skills. "While both groups performed RSPM test with equal accuracy, the autistic group responded more quickly and appeared to use perceptual regions of the brain to accelerate problem-solving," says lead author Isabelle Soulières, a post-doctoral fellow at Harvard University who completed the experiment at the Université de Montréal. "Some critics argued that autistics would be unable to complete the RSPM because of its complexity, yet our study shows autistics complete it as efficiently and have a more highly developed perception than non-autistics." Fifteen autistics and 18 non-autistics were recruited for the study. Participants were 14 to 36 years old and matched according to their preliminary results on the Wechsler Adult Intelligence Scale. All subjects underwent magnetic resonance imaging to explore their neural activity during RSPM problem-solving. While autism is a common neurodevelopmental disability characterized by profound differences in information processing and analysis, this study showed that autistics have efficient reasoning abilities that build on their perceptual strengths. "This study builds on our previous findings and should help educators capitalize on the intellectual abilities of autistics," says senior researcher Laurent Mottron, the new Marcel & Rolande Gosselin Research Chair in Autism Cognitive Neuroscience of the Université de Montréal and psychiatry professor. "The limits of autistics should constantly be pushed and their educational materials should never be simplified." Adds Dr. Soulières: "The Raven's Standard Progressive Matrices are among the most complex tests to provide insight on how a person understands and formulates rules, manages goal hierarchies and performs high-level abstractions. Our wager was that autistics could complete such a test and they surpassed our expectations." This study was funded by the Canadian Institutes of Health Research and Autism Speaks.

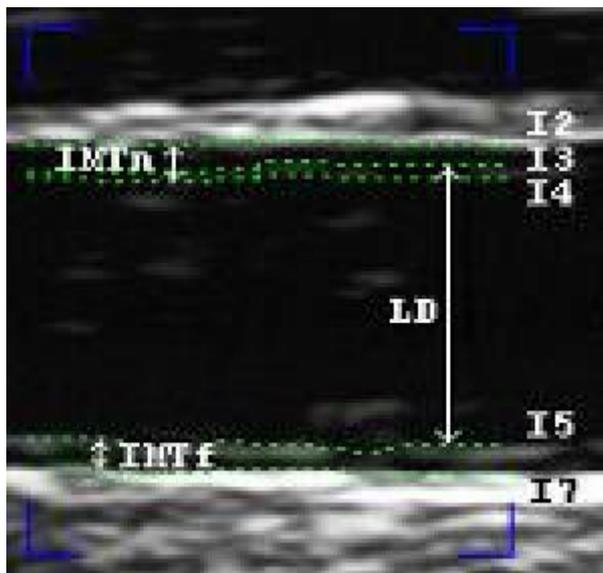
Journal reference:

1. Soulières, Gary E. **Enhanced visual processing contributes to matrix reasoning in autism.** *Human Brain Mapping*, 2009; DOI: [10.1002/hbm.20831](https://doi.org/10.1002/hbm.20831)

Adapted from materials provided by [University of Montreal](http://www.unimontreal.ca).

<http://www.sciencedaily.com/releases/2009/06/090616121339.htm>

Advanced Image Analysis Can Provide Better Risk Assessment In Hardening Of The Arteries



Peter Holdfeldt, who recently defended his doctoral thesis at Chalmers University of Technology in Sweden, has developed new analytical methods for ultrasound images that can provide more reliable and more exact assessments of atherosclerosis. (Credit: Chalmers University of Technology)

ScienceDaily (June 17, 2009) — Ultrasound examination of the carotid artery is a patient-friendly and inexpensive method for assessing atherosclerosis and thereby predicting the risk of cardiovascular diseases. Peter Holdfeldt, who recently defended his doctoral thesis at Chalmers University of Technology in Sweden, has developed new analytical methods for ultrasound images that can provide more reliable and more exact assessments of atherosclerosis.

Cardiovascular diseases brought on by hardening of the arteries are the most common cause of death in the Western world. Hardening of the arteries means a thickening of the walls of blood vessels and the appearance of so-called atherosclerotic plaque, which consist of stored fat, among other things.

With the aid of ultrasound images, it is possible to find individuals who are at risk by measuring the thickness of the walls in the carotid artery. Another ultrasound method is to analyze whether the character of various types of plaque can predict the risk of cardiovascular diseases.

Peter Holdfeldt has developed new and more refined methods of image analysis that are based on dynamic programming.

"Measurements of the thickness of the walls of the carotid require the detection of boundaries between different layers of tissue in the blood vessel," he says. "Previously dynamic programming has been used to automatically detect boundaries in still images. But the new method uses dynamic programming for detection in image sequences of one and the same blood vessel instead."

Examining an entire image sequence instead of a single image provides a more correct result, since it is possible to make use of the similarity between the images in the sequence - a boundary ought to be found in roughly the same place in two images in a row. The method comprises two steps. First, several alternative locations of the boundary are determined in each image. Then one of the alternatives is selected from each image, and it is in this step that the program factors in the movement of boundaries between images.

"This has proven to provide more correct detections of boundaries than what you can get from a program that detects boundaries on the basis of a single image," says Peter Holdfeldt.

He has also developed a method to automatically classify atherosclerotic plaque. This plaque can burst and form blood clots that cause heart attacks or strokes. In ultrasound images it is possible with the naked eye to see the type of plaque that often leads to stroke, but such an assessment is subjective and is influenced by disturbances in the image. The new automatic method entails a technological advancement of ultrasound technology that can lead to more objective and quantifiable analysis.

Peter Holdfeldt's research has been part of a collaborative project between Chalmers and the Wallenberg Laboratory for Cardiovascular Research at Sahlgrenska University Hospital in Gothenburg. Björn Fagerberg, a physician and professor of cardiovascular research, is responsible for the clinical evaluation of the new methods together with the doctoral candidate Ulrica Prahl.

"We're now busy testing the new automatic method for plaque classification in patient groups," he says. "In its final form it should be an excellent aid in identifying high-risk patients."

Measurement of the carotid artery is already in use today in cardiovascular research. There are other methods of measurement, but they are not as well validated as the method that has been developed by the researchers at Chalmers and Sahlgrenska.

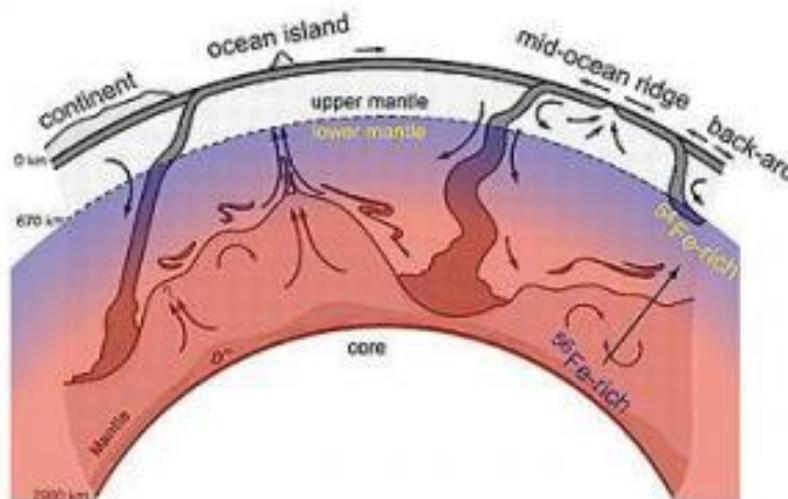
"Dynamic image analysis is an exciting new method that will no doubt offer great potential for elaboration," says Björn Fagerberg. "The advantage of using ultrasound is that is practical, inexpensive, and patient-friendly."

The dissertation "Dynamic Programming for Ultrasound Image Analysis of Atherosclerosis" was defended on May 15.

Adapted from materials provided by The Swedish Research Council, via AlphaGalileo.

<http://www.sciencedaily.com/releases/2009/06/090605112331.htm>

Super-computer Provides First Glimpse Of Earth's Early Magma Interior



This schematic of Earth's crust and mantle shows the results of a new study that found that extreme pressures would have concentrated iron's heavier isotopes near the bottom of the mantle as it crystallized from an ocean of magma to its solid form 4.5 billion years ago. (Credit: Louise Kellogg, modified by James Rustad & Qing-zhu Yin/UC Davis)

ScienceDaily (June 16, 2009) — By using a super-computer to virtually squeeze and heat iron-bearing minerals under conditions that would have existed when the Earth crystallized from an ocean of magma to its solid form 4.5 billion years ago, two UC Davis geochemists have produced the first picture of how different isotopes of iron were initially distributed in the solid Earth.

The discovery could usher in a wave of investigations into the evolution of Earth's mantle, a layer of material about 1,800 miles deep that extends from just beneath the planet's thin crust to its metallic core.

"Now that we have some idea of how these isotopes of iron were originally distributed on Earth," said study senior author James Rustad, a Chancellor's fellow and professor of geology, "we should be able to use the isotopes to trace the inner workings of Earth's engine."

A paper describing the study by Rustad and co-author Qing-zhu Yin, an associate professor of geology, was posted online by the journal *Nature Geoscience* on Sunday, June 14, in advance of print publication in July.

Sandwiched between Earth's crust and core, the vast mantle accounts for about 85 percent of the planet's volume. On a human time scale, this immense portion of our orb appears to be solid. But over millions of years, heat from the molten core and the mantle's own radioactive decay cause it to slowly churn, like thick soup over a low flame. This circulation is the driving force behind the surface motion of tectonic plates, which builds mountains and causes earthquakes.

One source of information providing insight into the physics of this viscous mass are the four stable forms, or isotopes, of iron that can be found in rocks that have risen to Earth's surface at mid-ocean ridges where seafloor spreading is occurring, and at hotspots like Hawaii's volcanoes that poke up through the Earth's crust. Geologists suspect that some of this material originates at the boundary between the mantle and the core some 1,800 miles beneath the surface.

"Geologists use isotopes to track physico-chemical processes in nature the way biologists use DNA to track the evolution of life," Yin said.

Because the composition of iron isotopes in rocks will vary depending on the pressure and temperature conditions under which a rock was created, Yin said, in principle, geologists could use iron isotopes in rocks collected at hot spots around the world to track the mantle's geologic history. But in order to do so, they would first need to know how the isotopes were originally distributed in Earth's primordial magma ocean when it cooled down and hardened.

As a team, Yin and Rustad were the ideal partners to solve this riddle. Yin and his laboratory are leaders in the field of using advanced mass spectrometric analytical techniques to produce accurate measurements of the subtle variations in isotopic composition of minerals. Rustad is renowned for his expertise in using large computer clusters to run high-level quantum mechanical calculations to determine the properties of minerals.

The challenge the pair faced was to determine how the competing effects of extreme pressure and temperature deep in Earth's interior would have affected the minerals in the lower mantle, the zone that stretches from about 400 miles beneath the planet's crust to the core-mantle boundary. Temperatures up to 4,500 degrees Kelvin in the region reduce the isotopic differences between minerals to a miniscule level, while crushing pressures tend to alter the basic form of the iron atom itself, a phenomenon known as electronic spin transition.

Using Rustad's powerful 144-processor computer, the two calculated the iron isotope composition of two minerals under a range of temperatures, pressures and different electronic spin states that are now known to occur in the lower mantle. The two minerals, ferropervskite and ferropericlase, contain virtually all of the iron that occurs in this deep portion of the Earth.

These calculations were so complex that each series Rustad and Yin ran through the computer required a month to complete.

In the end, the calculations showed that extreme pressures would have concentrated iron's heavier isotopes near the bottom of the crystallizing mantle.

It will be a eureka moment when these theoretical predictions are verified one day in geological samples that have been generated from the lower mantle, Yin said. But the logical next step for him and Rustad to take, he said, is to document the variation of iron isotopes in pure chemicals subjected to temperatures and pressures in the laboratory that are equivalent to those found at the core-mantle boundary. This can be achieved using lasers and a tool called a diamond anvil.

"Much more fun work lies ahead," he said. "And that's exciting."

The work was supported by the U.S. Department of Energy's Office of Basic Energy Sciences, and by a NASA Cosmochemistry grant and a NASA Origins of Solar Systems grant.

Journal reference:

1. James R. Rustad & Qing-Zhu Yin. **Iron isotope fractionation in the Earth's lower mantle.** *Nature Geoscience*, 14 June 2009 DOI: [10.1038/ngeo546](https://doi.org/10.1038/ngeo546)

Adapted from materials provided by [University of California - Davis](http://www.ucdavis.edu).

<http://www.sciencedaily.com/releases/2009/06/090615153118.htm>

Engineering Stereotypes Drive Counterproductive Practices

ScienceDaily (June 16, 2009) — To engineering students, scenes like these might sound familiar: students splitting up group projects so they don't have to work together. One student bragging that he did the problem without following the directions but still got the right answer. Another student bragging about how he did the whole project in the hour before class. It's practices like these that many students believe will help them become expert engineers — but it's the same practices that are the ire of managers who hire recent engineering graduates.

These are the findings of a study done by Paul Leonardi, the Breed Junior Chair in Design at Northwestern University's McCormick School of Engineering and Applied Science, with colleagues at the University of Colorado. "Industrial advisory boards are always saying engineers come to the workplace with good technical skills but they don't work well on team projects," says Leonardi, assistant professor of industrial engineering and management sciences and communication studies. "We wanted to know why. It's not a lack of skill — engineering students are smart people. So why aren't they working in teams?" The study, conducted over several years, included interviewing more than 130 undergraduate engineering students and observing lab sessions and group project work time in order to study the culture of undergraduate engineering. What they found was that when students entered engineering schools, they already had an idea of what an engineer should be from television programs and other media.

"There's a stereotype that engineers do things by themselves," Leonardi says. "So when students are asked to work in teams, they think, am I going to be disadvantaged? When I go to the workplace am I not going to be as valuable?" In other words, students believed that if they weren't able to do a project alone, they couldn't consider themselves an expert engineer. Leonardi and his colleagues often saw groups splitting up group work, even if they were specifically asked to work on it together at the same time.

Researchers also found that when professors gave out documents that detailed exactly how to build something, students would often throw them away and try to figure it out on their own — another practice that stems from the stereotype that engineers should be able to figure out problem solutions on their own.

"They would figure out workarounds and try to reintroduce more difficulty into the task," Leonardi says. "It was a mark of distinction not to follow the task." This was often partnered with what researchers called "delayed initiation" — i.e. procrastination. But students didn't procrastinate because they were lazy — they procrastinated in order to prove that they could figure out the problem in a short period of time. "All these practices were very counterproductive to working in a team," Leonardi says. Researchers even found that freshmen at first wouldn't engage in such practices; once they saw older classmates doing it, however, they, too, would take the social cues and engage in the practices. All the while, students would continually justify their actions as "that's what engineers do," and continued justification made the practices seem that much more natural.

To combat this, professional societies often say that engineering schools should put more team-based projects into curriculum, but Leonardi argues that isn't enough. "The change we need is helping to put new kinds of stereotypes and images of what it means to be an engineer into the culture so students can reflect on those and think about changing their work practices to align with what we really want engineers to be," he says. "It's important for organizations to get involved with engineering education, providing internships and co-op opportunities, because it allows students to see early on other images of engineering so they can see that there are images of engineers out there other than the expert loner."

The study was recently published in the *Academy of Management Journal*.

Adapted from materials provided by [Northwestern University](http://www.northwestern.edu).

<http://www.sciencedaily.com/releases/2009/06/090608182553.htm>

Betelgeuse, Red Supergiant In Constellation Orion, Has Shrunk By 15 Percent In 15 Years



UC Berkeley physicist Charles Townes, who won the 1964 Nobel Prize in Physics for invention of the laser, cleans one of the large mirrors of the Infrared Spatial Interferometer. The ISI is on the top of Mt. Wilson in Southern California. (Credit: Cristina Ryan (2008))

ScienceDaily (June 16, 2009) — The red supergiant star Betelgeuse, the bright reddish star in the constellation Orion, has steadily shrunk over the past 15 years, according to University of California, Berkeley, researchers.

Long-term monitoring by UC Berkeley's Infrared Spatial Interferometer (ISI) on the top of Mt. Wilson in Southern California shows that Betelgeuse (bet' el juz), which is so big that in our solar system it would reach to the orbit of Jupiter, has shrunk in diameter by more than 15 percent since 1993.

Since Betelgeuse's radius is about five astronomical units, or five times the radius of Earth's orbit, that means the star's radius has shrunk by a distance equal to the orbit of Venus.

"To see this change is very striking," said Charles Townes, a UC Berkeley professor emeritus of physics who won the 1964 Nobel Prize in Physics for inventing the laser and the maser, a microwave laser. "We will be watching it carefully over the next few years to see if it will keep contracting or will go back up in size."

Townes and his colleague, Edward Wishnow, a research physicist at UC Berkeley's Space Sciences Laboratory, will discuss their findings at a 12:40 p.m. PDT press conference on Tuesday, June 9, during the Pasadena meeting of the American Astronomical Society (AAS). The results were published June 1 in *The Astrophysical Journal Letters*.

Despite Betelgeuse's diminished size, Wishnow pointed out that its visible brightness, or magnitude, which is monitored regularly by members of the American Association of Variable Star Observers, has shown no significant dimming over the past 15 years.

The ISI has been focusing on Betelgeuse for more than 15 years in an attempt to learn more about these giant massive stars and to discern features on the star's surface, Wishnow said. He speculated that the measurements may be affected by giant convection cells on the star's surface that are like convection granules on the sun, but so large that they bulge out of the surface. Townes and former graduate student Ken Tatebe observed a bright spot on the surface of Betelgeuse in recent years, although at the moment, the star appears spherically symmetrical.

"But we do not know why the star is shrinking," Wishnow said. "Considering all that we know about galaxies and the distant universe, there are still lots of things we don't know about stars, including what happens as red giants near the ends of their lives."

Betelgeuse was the first star ever to have its size measured, and even today is one of only a handful of stars that appears through the Hubble Space Telescope as a disk rather than a point of light. In 1921, Francis G. Pease and Albert Michelson used optical interferometry to estimate its diameter was equivalent to the orbit of Mars. Last year, new measurements of the distance to Betelgeuse raised it from 430 light years to 640, which increased the star's diameter from about 3.7 to about 5.5 AU.

"Since the 1921 measurement, its size has been re-measured by many different interferometer systems over a range of wavelengths where the diameter measured varies by about 30 percent," Wishnow said. "At a given wavelength, however, the star has not varied in size much beyond the measurement uncertainties."

The measurements cannot be compared anyway, because the star's size depends on the wavelength of light used to measure it, Townes said. This is because the tenuous gas in the outer regions of the star emits light as well as absorbs it, which makes it difficult to determine the edge of the star.

The ISI that Townes and his colleagues first built in the early 1990s sidesteps these confounding emission and absorption lines by observing in the mid-infrared with a narrow bandwidth that can be tuned between spectral lines. The ISI consists of three 5.4-foot (1.65-meter) diameter mirrors separated by distances that vary from 12 to 230 feet (4-70 meters), said Townes. Using a laser as a common frequency standard, the ISI interferometer combines signals from telescope pairs in order to determine path length differences between light that originates at the star's center and light that originates at the star's edge. The technique of stellar interferometry is highlighted in the June 2009 issue of *Physics Today* magazine.

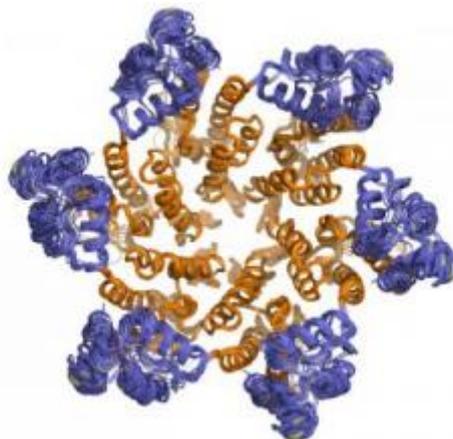
"We observe around 11 microns, the mid-infrared, where this long wavelength penetrates the dust and the narrow bandwidth avoids any spectral lines, and so we see the star relatively undistorted," said Townes. "We have also had the good fortune to have an instrument that has operated in a very similar manner for some 15 years, providing a long and consistent series of measurements that no one else has. The first measurements showed a size quite close to Michelson's result, but over 15 years, it has decreased in size about 15 percent, changing smoothly, but faster as the years progressed."

Townes, who turns 94 in July, plans to continue monitoring Betelgeuse in hopes of finding a pattern in the changing diameter, and to improve the ISI's capabilities by adding a spectrometer to the interferometer. "Whenever you look at things with more precision, you are going to find some surprises and uncover very fundamental and important new things," he said. The ISI is supported by grants from the National Science Foundation, the Gordon and Betty Moore Foundation and the Office of Naval Research.

Adapted from materials provided by [University of California - Berkeley](http://www.sciencedaily.com/releases/2009/06/090609220555.htm).

<http://www.sciencedaily.com/releases/2009/06/090609220555.htm>

Structure Of HIV Protein Shell Revealed



*This is a view of the CA protein hexamer, which makes up the HIV capsid. This image, which reflects a perspective from inside the capsid, is a superposition of the structures reported in the new *Cell* paper. It shows that six N-terminal domains of CA (colored orange) form the core of the hexamer, and this core is surrounded by a floppy belt of C-terminal domains (colored blue). (Credit: Image courtesy of Scripps Research Institute)*

ScienceDaily (June 16, 2009) — New research by scientists at The Scripps Research Institute and other institutions provides a close-up look at the cone-shaped shell that is the hallmark of human immunodeficiency virus (HIV), revealing how it is held together—and possible ways to break it apart.

Previously, scientists had known that the genetic material within HIV is enclosed within a shell called the capsid, which is formed by a honeycomb arrangement of about 250 hexagonal protein building blocks. For HIV to infect human cells, the virus binds to cell surface receptors, and then the capsid is delivered into the cytoplasm of the cell.

Now, in an advance, online issue of the journal *Cell* published on June 11, 2009, Professor Mark Yeager and colleagues at The Scripps Research Institute, the University of Virginia, and the University of Utah describe the first high-resolution molecular structure of the hexagonal protein building block, called CA, that makes up the HIV capsid. This detailed description may help scientists identify new ways to block HIV infection.

Bringing Down the Capsid

Since HIV/AIDS was first recognized in 1981, several drugs and drug combinations have allowed infected individuals to live longer and healthier lives. However, resistance to the existing drugs has created an urgent need for novel therapeutic strategies.

Current drugs target critical steps in the virus life cycle. For example, protease inhibitors block the protein cleavages that generate viral components—one of them being the protein CA.

Other possible ways to block infection would be to prevent formation of the capsid by blocking assembly of CA molecules or to find a way to disassemble the capsid once it is made.

"Anything that destabilizes the capsid, either by inhibiting assembly or accelerating disassembly should attenuate or even kill the virus," says Owen Pornillos, an investigator in Yeager's lab and first author of the *Cell* paper.

But to destabilize the capsid, it's necessary to know precisely how it is held together.

Making Crystals

"No one had been able to visualize the CA hexamer at atomic resolution," says Yeager. "Other groups had been able to solve structures of individual regions of CA. But it was not clear from these structures exactly how the CA proteins fit together."

To make the capsid, sets of six CA protein molecules first form hexamers, which then associate with one another to build a honeycomb-like shell comprised of about 250 hexamers. The ends of the shell are closed by insertion of seven and five CA protein pentamers, yielding the characteristic cone-like appearance of the capsid.

In 2007, Yeager's group managed to view the CA hexamers by a type of electron microscopy in which the samples are quick frozen in buffers, which preserves the inherent structure of proteins. That study provided the first glimpse of how CA proteins are arranged in the capsid. (The first author of the 2007 article was Barbie Ganser-Pornillos, Owen Pornillos' wife, who was also involved in the current study.)

In order to view the CA hexamer at even higher resolution, Yeager's group turned to X-ray crystallography. This technique requires growing 3D crystals of a molecule and then scattering a beam of X-rays off the crystals, which are recorded on a detector. Computational methods are then used to interpret the scattering patterns to calculate the position of every atom in the crystallized molecule.

But growing large, 3D crystals of the CA hexamer was no easy feat. The two ends of each CA protein molecule are held together by a "floppy" bridge, which precluded formation of orderly arrays of CA hexamers to form 3D crystals.

To overcome the problem, Pornillos and Yeager turned to molecular biology. They engineered CA proteins that would form sturdy chemical links between them, relying on the 2007 structure as their roadmap to determine exactly where to place the links.

"Our work takes advantage of so-called hybrid methods—molecular biology, biochemistry, electron microscopy, and X-ray crystallography," says Yeager. "These methods are synergistic. The EM results guided the molecular biology to engineer stable CA hexamers that were then amenable to 3D crystallization and X-ray structure analysis at atomic resolution."

The structure they obtained provided a view of the CA hexamer at an unprecedented resolution of two-Ångstrom (one Ångstrom equals one ten-billionth of a meter).

A Close-Up Look

All proteins are composed of linear chains of amino acids—with one end called the N-terminus and the opposite end the C-terminus—that are folded in three-dimensional shapes. In the CA protein, amino acid chains are twisted into several rods, called α -helices, with extensions—called side chains—that protrude from the main chain to interact with other folded regions of the protein.

The two-Ångstrom structure showed the positioning of these α -helices and, for the first time, the location of the atoms in the side chains. "We could precisely delineate all the chemical interactions that stabilize the hexamer," says Yeager.

The center of the CA hexamer is formed by 6 N-terminal ends of the CA protein subunits. The C-terminal domains form a "floppy" belt around this central core, connecting adjacent hexamers. The fact that the belt is not held rigidly in place, helps explain how the honeycomb shape of the capsid forms. "The curvature of the capsid is not constant," says Pornillos. "Now we can see in atomic detail how flexibility in CA makes this happen."



The group discovered another set of interactions critical to stabilizing the capsid—connections between the N-terminal and C-terminal ends of adjacent CA protein molecules in one hexamer. "Think of the fingers of one hand as the N-terminal domain and the palm as the C-terminal," says Yeager. "Imagine the fingers of one hand being cradled in the palm of the other, and so on as if you had six hands in a ring."

Knowing precisely how and where CA proteins interact gives researchers clues on how to interfere with these connections. One approach is to design small molecules that can insert themselves at strategic positions, impeding capsid assembly or making the capsid less stable.

While finding HIV therapies is a main driver for Yeager's work, he points out that it also provides fundamental insights into biology. "Determining the assembly of a relatively simple structure like the capsid of a virus can help us understand how more complex biological structures inside the cell are organized," he explains.

In addition to Yeager, Pornillos, and Ganser-Pornillos of Scripps Research and the University of Virginia, co-authors of the paper include Yuanzi Hua and C. David Stout at Scripps Research, and Brian N. Kelly, Frank G. Whitby, Wesley I. Sundquist, and Christopher P. Hill at the University of Utah School of Medicine.

This study was funded by the National Institutes of Health and the George E. Hewitt Foundation for Medical Research. Facilities supported by the National Institutes of Health and the U.S. Department of Energy were also used to collect data.

Journal reference:

1. Pornillos et al. **X-Ray Structures of the Hexameric Building Block of the HIV Capsid**. *Cell*, 2009; DOI: [10.1016/j.cell.2009.04.063](https://doi.org/10.1016/j.cell.2009.04.063)

Adapted from materials provided by Scripps Research Institute.

<http://www.sciencedaily.com/releases/2009/06/090612163537.htm>



'Shortcuts' Of The Mind Lead To Miscalculations Of Weight And Caloric Intake, Study Finds

ScienceDaily (June 16, 2009) — Psychologists at the University of Pennsylvania have identified a cognitive shortcut, or heuristic, they call "Unit Bias," which causes people to ignore vital, obvious information in their decision-making process, points to a fundamental flaw in the modern, evolved mind and may also play a role in the American population's 30 years of weight gain.

Researchers who focus on the cognitive aspects that contribute to obesity conducted several studies with college-age participants in which the subjects were asked to estimate the weight of adult women from either photographs or a live presentation by models. Other student participants were asked to estimate the calories in one of two actual meals. Both meals contained the same foods, but one had larger portion sizes than the other.

The results demonstrated that when estimating the body weight of women, participants apparently disregard or ignore the provided height information and focus solely on the width of the model. In certain instances, researchers would inflate the provided height information of the models as much as 10 inches, though that did not alter participants' estimates of the models' weights. When estimating calories, study participants assumed portion sizes were culturally typical and guessed no caloric differences between small and large portions. The findings are akin to asking a room full of people to calculate the volume of a box when given only the height and width and no one asks for the length. Or, more accurately, the length is provided and no one pays attention to that one, crucial dimension, thereby making it impossible to arrive at the correct answer. The study suggests that there are situations where critical dimensions to understanding are devalued or ignored. The paper examines different circumstances discovered by researchers where single dimensions dominate multidimensional judgments. In these studies specifically, participants estimated body weight based on the model's shape even though height information was provided in the photographs or directly available with live models. Meanwhile, participants devalued or completely ignored other parameters critical to an accurate judgment.

Penn psychologists point to the study as a novel example of the negative artifacts packaged within the evolved way the human brain processes information. The mind has evolved to develop a capacity to free up our conscious thinking for dangerous and reproductive situations. For example, a driver at a green light doesn't need to cycle through a series of decisions. Green simply means go. The brain has evolved to remove common or repetitive situations or tasks from our awareness because the capacity of our consciousness is quite limited. What ties these studies together is that missing information was literally thrust in the face of participants, and yet they didn't use it. "We have heuristics in our brain — simple mechanistic shortcuts that have evolved over hundreds of thousands of years, which free up precious space in our consciousness," said Andrew Geier, lead author in the Department of Psychology in Penn's School of Arts and Sciences. "In these atypical instances, however, it's the shortcut that hurts us."

The researchers believe that the negative artifacts of the evolved mind may be directly connected with America's obesity epidemic. "We have evolved in a very different environment," Geier said. "It used to be that food was scarce, and you ate what was available because you didn't know where your next meal would come from. That is not the case anymore. Although we have yet to prove this, we believe that the ecology of eating in the current food environment has become an example of the atypical situations demonstrated in this new article, which may be an explanation for why almost 70 percent of American adults are either overweight or obese. This represents a cognitive explanation for why America is gaining so much weight. The eating environment has morphed into an atypical scenario where our usually helpful mental mechanisms betray us." The study, published in the June issue of the *Journal of Experimental Psychology--Applied*, was written by Geier and Paul Rozin of the Penn Department of Psychology, which supported the study.

Adapted from materials provided by [University of Pennsylvania](http://www.universityofpennsylvania.edu).

<http://www.sciencedaily.com/releases/2009/06/090615153116.htm>

Rare Magnetar Discovered: Giant Eruption Reveals 'Dead' Star

SGR 0501+4516, illustrated here in an artist concept, is a member of a select class of objects called magnetars. These stellar remnants are the most magnetized objects in the cosmos. Only 15 are known. (Credit: NASA/Goddard Space Flight Center Conceptual Image Lab)



ScienceDaily (June 16, 2009) — NASA's Swift satellite reported multiple blasts of radiation from a rare object known as a soft gamma repeater, or SGR. Now, astronomers report an in-depth study of these eruptions using the European Space Agency's XMM-Newton and International Gamma-Ray Astrophysics Laboratory (INTEGRAL) satellites.

The object, designated SGR 0501+4516, was the first of its type discovered in a decade and is only the fifth confirmed SGR. "Some sources are extremely active, but others can be quiet for a decade or more," said Nanda Rea, University of Amsterdam, who led the study. "This suggests many members of this class remain unknown." Astronomers think the eruptions of SGRs arise from the most highly magnetized objects in the universe -- magnetars. Magnetars are neutron stars -- the crushed cores of exploded stars -- that, for reasons not yet known, possess ultra-strong magnetic fields. With fields 100 trillion times stronger than Earth's, a magnetar placed half the moon's distance would wipe the magnetic strips of every credit card on the planet. "Magnetars allow us to study extreme matter conditions that cannot be reproduced on Earth," said Kevin Hurley, a team member at the University of California, Berkeley.

Both SGRs and a related group of high-energy neutron stars -- called anomalous X-ray pulsars -- are thought to be magnetars. But, all told, astronomers know of only 15 examples.

SGR 0501+4516, estimated to lie about 15,000 light years away, was only discovered because its outburst gave it away. Astronomers think an unstable configuration of the star's magnetic field triggers the eruptions. "Once the magnetic field resumes a more stable configuration, the activity ceases and the star returns to quiet and dim emission," Rea said.

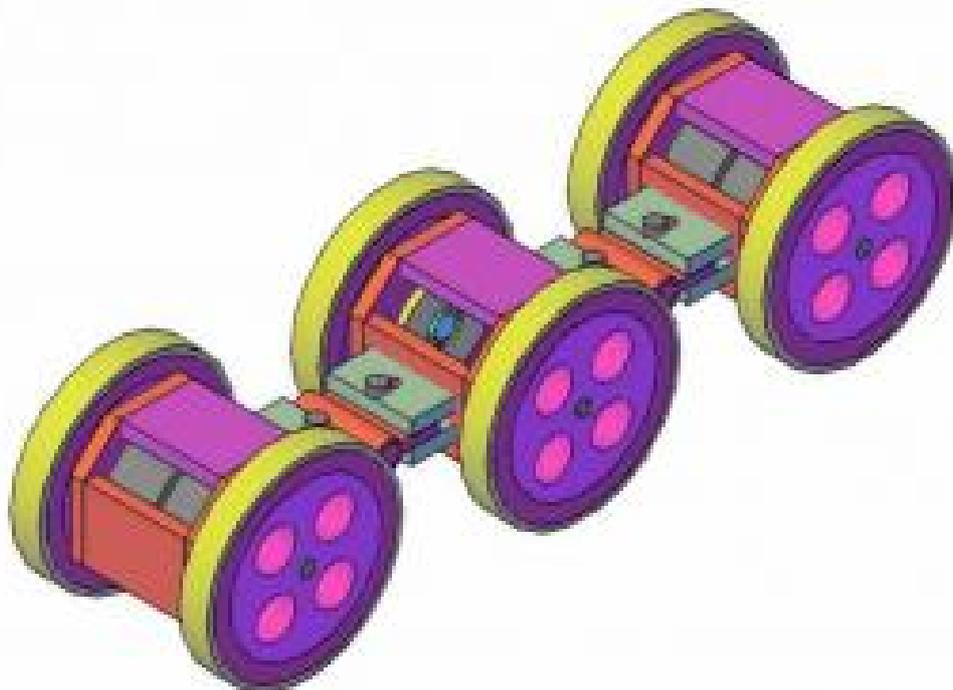
Twelve hours after Swift pinpointed SGR 0501+4516, XMM-Newton began the most detailed study of a fading magnetar outburst ever attempted. The object underwent hundreds of small bursts over a period of more than four months. Only five days after the initial eruption, INTEGRAL detected X-rays from the object that were beyond the energy range XMM-Newton can see. It's the first time such transient high-energy X-ray emission has been detected during an SGR's outburst phase. This emission disappeared within ten days of the outburst. The findings were published online June 15 in the Monthly Notices of the Royal Astronomical Society.

The team plans further observations of SGR 0501+4516 with XMM-Newton. They hope to detect the object in a quiet state in order to probe the calm after the storm.

Adapted from materials provided by [NASA/Goddard Space Flight Center](http://www.nasa.gov).

<http://www.sciencedaily.com/releases/2009/06/090616121353.htm>

Robotic Ferret Will Detect Hidden Drugs And Weapons



Researchers have developed a 'cargo-screening ferret' for use at seaports and airports to detect drugs, weapons, explosives and illegal immigrants. (Credit: Image courtesy of Engineering and Physical Sciences Research Council)

ScienceDaily (June 16, 2009) — A new type of robot being developed will make it easier to detect drugs, weapons, explosives and illegal immigrants concealed in cargo containers.

Dubbed the 'cargo-screening ferret' and designed for use at seaports and airports, the device is being worked on at the University of Sheffield with funding from the Engineering and Physical Sciences Research Council (EPSRC).

The ferret will be the world's first cargo-screening device able to pinpoint all kinds of illicit substances and the first designed to operate inside standard freight containers.

It will be equipped with a suite of sensors that are more comprehensive and more sensitive than any currently employed in conventional cargo scanners.

Recent advances in both laser and fibre optic technology now make it possible to detect tiny particles of different substances. The EPSRC-funded project team is developing sensors which incorporate these technologies and that are small enough to be carried on the 30cm-long robot, in order to detect the specific 'fingerprint' of illegal substances at much lower concentrations than is now possible.

When placed inside a steel freight container, the ferret will attach itself magnetically to the top, then automatically move around and seek out contraband, sending a steady stream of information back to its controller.

Current cargo-screening methods rely on a variety of separate methods, such as the use of sniffer dogs and external scanners for detecting explosives and drugs and carbon dioxide probes and heartbeat monitors to detect a human presence.



Cargo scanners currently in use at seaports and airports only generate information on the shape and density of objects or substances. The ferret, however, will be able to provide information on what they actually consist of as well.

"It's essential we develop something which is simple to operate and which Border Agents can have total confidence in," says Dr Tony Dodd, who is leading the project. "The ferret will be able to drop small probes down through the cargo and so pinpoint exactly where contraband is concealed."

Working prototypes of the cargo-screening ferret could be ready for testing within two years, with potential deployment within around five years.

The 3-year project 'Cargo Screening Ferret' began in October 2008 and is receiving total EPSRC funding of nearly £732,000.

The project also involves the University of Glasgow, Loughborough University, City University London and defence and security specialists Qinetiq.

The idea for the project emerged from an event organised by EPSRC, the Home Office Scientific Development Branch and the UK Borders Agency.

The ferret will offer major advantages in combating human trafficking. Currently, it is very difficult to detect people hidden in freight containers (e.g. the use of X-rays is prohibited due to the harm the radiation could do to anyone concealed there). Sensors on board the ferret will be able to detect tiny traces of carbon dioxide which indicate the presence of humans concealed in the containers.

Another key benefit is that the ferret will reduce the need for customs and security officials to enter or unpack freight containers, which is time-consuming and may expose officers to danger or possible contamination by harmful substances.

By combining two different types of sensor (laser and fibre optic-based), the ferret will lead to confidence in detection being considerably improved.

Adapted from materials provided by Engineering and Physical Sciences Research Council, via EurekaAlert!, a service of AAAS

<http://www.sciencedaily.com/releases/2009/06/090612115531.htm>



Breakthrough In Early Detection And Prevention Of Age-related Macular Degeneration

ScienceDaily (June 16, 2009) — Researchers at the University of North Carolina at Chapel Hill School of Medicine in collaboration with lead investigators at the University of Kentucky have identified a new target for the diagnosis and treatment of age-related macular degeneration, the most common cause of blindness in older Americans.

In a study published online June 14, 2009 by the journal *Nature*, the researchers demonstrate that blocking the activity of a specific protein – called CCR3 -- can reduce the abnormal blood vessel growth that leads to macular degeneration. Furthermore, targeting this new protein may prove to be safer and more effective than the current treatment for the disease, which is directed at a protein called vascular endothelial growth factor or “VEGF.”

The discovery -- made in mouse models and cultured human cells -- may also enable physicians to catch the disease in its earliest stages, before blood vessels have fully infiltrated and destroyed the central portion of the eye’s retina -- an area known as the macula -- to cause vision loss. “It would be much better to prevent the disease in the first place,” said study co-author and principal investigator of the UNC study site, Mary Elizabeth Hartnett, M.D., a professor of ophthalmology in the UNC School of Medicine. “An exciting implication of this study was that the CCR3 protein could be detected in early abnormal blood vessel growth, giving us the opportunity to prevent structural damage to the retina and preserve vision.”

Age-related macular degeneration (AMD) affects 30 to 50 million people globally, and that number is expected to double in the next decade as the baby boomer generation ages. The disease is currently treated with drugs that block the effects of VEGF, a growth factor that promotes the growth of abnormal blood vessels. However, because this factor is also involved in the growth and health of normal blood vessels, concerns have been raised about the safety of its long-term use. To date, however, these anti-VEGF agents have been found to be safe.

Thus, the investigators sought to identify a new target for treatment that is specific to AMD. They detected the presence of the CCR3 protein in eye tissue from humans with AMD but not in that of individuals of similar age who did not have the disease. When they blocked CCR3, either with drugs or through genetic engineering, they saw a decrease in the generation of abnormal blood vessels. Drugs targeting CCR3 were significantly more effective than those targeting VEGF, meaning this could represent a new therapy for the two-thirds of patients that do not respond to current treatment.

The researchers now may look to see if levels of the protein can be detected in the bloodstream in order to identify people who are at risk of developing the disease. They also plan to search for genetic changes in the CCR3 gene in patients with AMD to better understand its causes.

The National Eye Institute, a component of the National Institutes of Health, helped support this research.

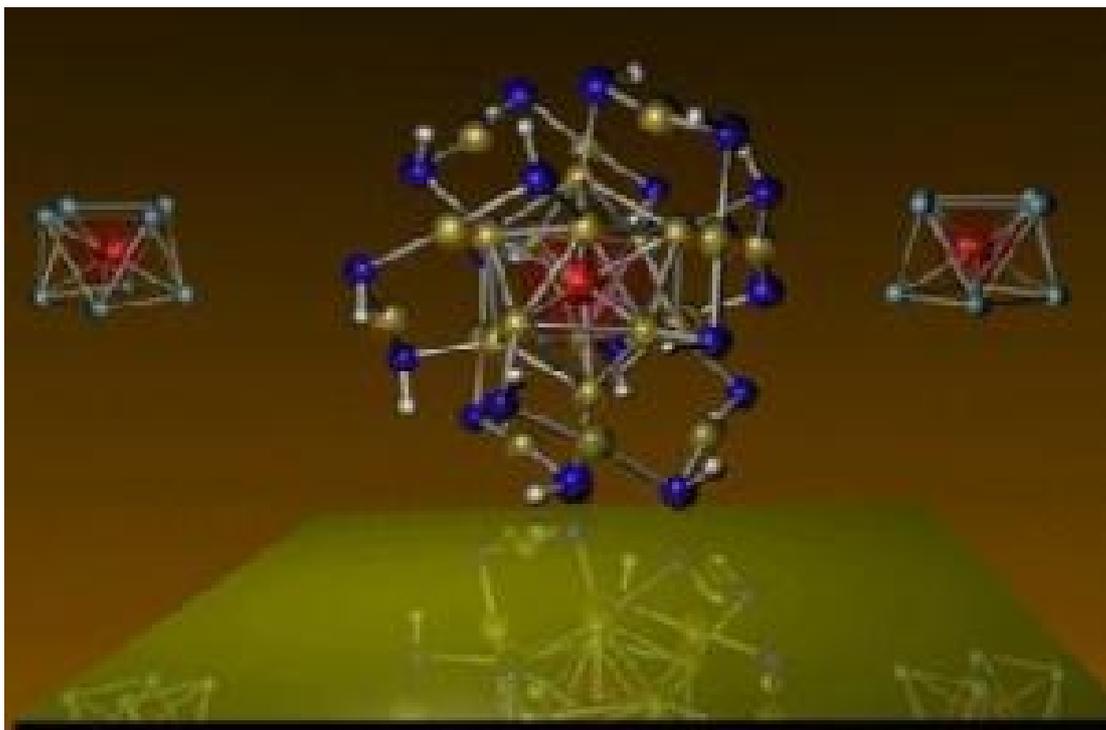
Journal reference:

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Adapted from materials provided by [University of North Carolina School of Medicine](http://www.uncc.edu).

<http://www.sciencedaily.com/releases/2009/06/090614153257.htm>

Magnetic Super-atoms Discovered



VCs8 and MnAu24(SH)18 magnetic superatoms that mimic a manganese atom. The MnAu24 cluster is surrounded by sulfur and hydrogen atoms to protect it against outside attack, thus making it valuable for use in biomedical applications. (Credit: Image courtesy of Ulises Reveles, Ph.D, VCU.)

ScienceDaily (June 16, 2009) — A team of Virginia Commonwealth University scientists has discovered a ‘magnetic superatom’ – a stable cluster of atoms that can mimic different elements of the periodic table – that one day may be used to create molecular electronic devices for the next generation of faster computers with larger memory storage.

The newly discovered cluster, consisting of one vanadium and eight cesium atoms, acts like a tiny magnet that can mimic a single manganese atom in magnetic strength while preferentially allowing electrons of specific spin orientation to flow through the surrounding shell of cesium atoms. The findings appear online in the journal *Nature Chemistry*.

Through an elaborate series of theoretical studies, Shiv N. Khanna, Ph.D., professor in the VCU Department of Physics, together with VCU postdoctoral associates J. Ulises Reveles, A.C. Reber, and graduate student P. Clayborne, and collaborators at the Naval Research Laboratory in D.C., and the Harish-Chandra Research Institute in Allahabad, India, examined the electronic and magnetic properties of clusters having one vanadium atom surrounded by multiple cesium atoms.

They found that when the cluster had eight cesium atoms it acquired extra stability due to a filled electronic state. An atom is in a stable configuration when its outermost shell is full. Consequently, when an atom combines with other atoms, it tends to lose or gain valence electrons to acquire a stable configuration.

According to Khanna, the new cluster had a magnetic moment of five Bohr magnetons, which is more than twice the value for an iron atom in a solid iron magnet. A magnetic moment is a measure of the internal magnetism of the cluster. A manganese atom also has a similar magnetic moment and a closed



electronic shell of more tightly bound electrons, and Khanna said that the new cluster could be regarded as a mimic of a manganese atom.

“An important objective of the discovery was to find what combination of atoms will lead to a species that is stable as we put multiple units together. The combination of magnetic and conducting attributes was also desirable. Cesium is a good conductor of electricity and hence the superatom combines the benefit of magnetic character along with ease of conduction through its outer skin,” Khanna said.

“A combination such as the one we have created here can lead to significant developments in the area of “molecular electronics,” a field where researchers study electric currents through small molecules. These molecular devices are expected to help make non-volatile data storage, denser integrated devices, higher data processing and other benefits,” he said.

Khanna and his team are conducting preliminary studies on molecules composed of two such superatoms and have made some promising observations that may have applications in spintronics. Spintronics is a process using electron spin to synthesize new devices for memory and data processing.

The researchers have also proposed that by combining gold and manganese, one can make other superatoms that have magnetic moment, but will not conduct electricity. These superatoms may have potential biomedical applications such as sensing, imaging and drug delivery.

This research was supported by the U.S. Department of the Army.

Adapted from materials provided by [Virginia Commonwealth University](#).

<http://www.sciencedaily.com/releases/2009/06/090615153120.htm>



Newborn Weights Affected By Environmental Contaminants

ScienceDaily (June 16, 2009) — Recent epidemiological studies have revealed an increase in the frequency of genital malformations in male newborns (e.g., un-descended testes) and a decrease in male fertility.

The role played by the growing presence in our environment of contaminants that reduce male hormone action could explain this phenomenon.

It is known that the birth weight of males is higher than that of females due to the action of male hormones on the male fetus. If the exposure of pregnant women to environmental contaminants that diminish the action of male hormones has increased over the years, one would expect to see a decrease in the sex difference in birth weight.

This is exactly what a new study published in the July 2009 issue of *Epidemiology* shows. Investigators analyzed the Public Health Agency of Canada's database on the birth weights of more than five million children born in Canada between 1981 and 2003.

Using statistical methods that control for changes over time of mother's age and parity, the investigators effectively show a sustained decrease in birth weight differences between boys and girls, which supports the hypothesis of growing endocrine disruption related to environmental contaminants. Contaminants found in plastic materials represent plausible candidates, since they are known to diminish the action of male hormones.

"Our study underlines the importance of probing the impact of environmental contaminants on the health of mothers and fetuses and on the reproductive potential of future generations," says lead researcher Dr. Guy Van Vliet, a pediatric endocrinologist and investigator at the Sainte-Justine University Hospital Research Center and a professor at the Department of Pediatrics of the Université de Montréal.

The study was carried out under the auspices of the Canadian Perinatal Surveillance System (CPSS).

Journal reference:

1. Van Vliet et al. **Decreasing Sex Difference in Birth Weight.** *Epidemiology*, 2009; 20 (4): 622
DOI: [10.1097/EDE.0b013e3181a82806](https://doi.org/10.1097/EDE.0b013e3181a82806)

Adapted from materials provided by [University of Montreal](http://www.univ-montreal.ca), via [EurekAlert!](http://www.eurekalert.com), a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090615144211.htm>

New Exotic Material Could Revolutionize Electronics



Surface electron band structure of bismuth telluride. (Credit: Image courtesy of Yulin Chen and Z. X. Shen)

ScienceDaily (June 16, 2009) — Move over, silicon—it may be time to give the Valley a new name. Physicists at the Department of Energy's (DOE) SLAC National Accelerator Laboratory and Stanford University have confirmed the existence of a type of material that could one day provide dramatically faster, more efficient computer chips.

Recently-predicted and much-sought, the material allows electrons on its surface to travel with no loss of energy at room temperatures and can be fabricated using existing semiconductor technologies. Such material could provide a leap in microchip speeds, and even become the bedrock of an entirely new kind of computing industry based on spintronics, the next evolution of electronics.

Physicists Yulin Chen, Zhi-Xun Shen and their colleagues tested the behavior of electrons in the compound bismuth telluride. The results, published online June 11 in *Science Express*, show a clear signature of what is called a topological insulator, a material that enables the free flow of electrons across its surface with no loss of energy.

The discovery was the result of teamwork between theoretical and experimental physicists at the Stanford Institute for Materials & Energy Science, a joint SLAC-Stanford institute. In recent months, SIMES theorist Shoucheng Zhang and colleagues predicted that several bismuth and antimony compounds would act as topological insulators at room-temperature. The new paper confirms that prediction in bismuth telluride. "The working style of SIMES is perfect," Chen said. "Theorists, experimentalists, and sample growers can collaborate in a broad sense."

The experimenters examined bismuth telluride samples using X-rays from the Stanford Synchrotron Radiation Lightsource at SLAC and the Advanced Light Source at Lawrence Berkeley National Laboratory. When Chen and his colleagues investigated the electrons' behavior, they saw the clear signature of a topological insulator. Not only that, the group discovered that the reality of bismuth telluride was even better than theory.

"The theorists were very close," Chen said, "but there was a quantitative difference." The experiments showed that bismuth telluride could tolerate even higher temperatures than theorists had predicted. "This means that the material is closer to application than we thought," Chen said.

This magic is possible thanks to surprisingly well-behaved electrons. The quantum spin of each electron is aligned with the electron's motion—a phenomenon called the quantum spin Hall effect. This alignment is a key component in creating spintronics devices, new kinds of devices that go beyond standard electronics. "When you hit something, there's usually scattering, some possibility of bouncing back," explained theorist Xiaoliang Qi. "But the quantum spin Hall effect means that you can't reflect to exactly the reverse path." As a dramatic consequence, electrons flow without resistance. Put a voltage on a topological insulator, and this special spin current will flow without heating the material or dissipating.

Topological insulators aren't conventional superconductors nor fodder for super-efficient power lines, as they can only carry small currents, but they could pave the way for a paradigm shift in microchip development. "This could lead to new applications of spintronics, or using the electron spin to carry information," Qi said. "Whether or not it can build better wires, I'm optimistic it can lead to new devices, transistors, and spintronics devices."

Fortunately for real-world applications, bismuth telluride is fairly simple to grow and work with. Chen said, "It's a three-dimensional material, so it's easy to fabricate with the current mature semiconductor technology. It's also easy to dope—you can tune the properties relatively easily."

"This is already a very exciting thing," he said, adding that the material "could let us make a device with new operating principles."

The high quality bismuth telluride samples were grown at SIMES by James Analytis, Ian Fisher and colleagues.

SIMES, the Stanford Synchrotron Radiation Lightsource at SLAC, and the Advanced Light Source at Lawrence Berkeley National Laboratory are supported by the Office of Basic Energy Sciences within the DOE Office of Science.

Journal reference:

1. Chen et al. **Experimental Realization of a Three-Dimensional Topological Insulator, Bi₂Te₃**. *Science*, 2009; DOI: [10.1126/science.1173034](https://doi.org/10.1126/science.1173034)

Adapted from materials provided by [DOE/SLAC National Accelerator Laboratory](http://www.slac.stanford.edu/).

<http://www.sciencedaily.com/releases/2009/06/090615144431.htm>

Deforestation Causes 'Boom-and-bust' Development In The Amazon



An average of 1.8 million hectares of forest are lost annually in the Brazilian Amazon, corresponding to nearly one third of global tropical deforestation, and releasing approximately 250 million tons of carbon. (Credit: Alexander Lees)

ScienceDaily (June 16, 2009) — Clearing the Amazon rainforest increases Brazilian communities' wealth and quality of life, but these improvements are short-lived, according to new research published today (12 June) in *Science*. The study, by an international team including researchers at the University of Cambridge and Imperial College London, shows that levels of development revert back to well below national average levels when the loggers and land clearers move on.

Since 2000, 155 thousand square kilometres of rainforest in the Brazilian Amazon have been cut down for timber, burnt, or cleared for agricultural use. Forest clearance rates have averaged more than 1.8 million hectares per year (roughly the area of Kuwait), and the deforestation frontier is advancing into the forest at a rate of more than four football fields every minute.

The team behind today's study analysed changes in the average life expectancy, literacy and per capita income of people living in 286 Brazilian Amazon municipalities with varying levels of deforestation. The Amazon is one of the least developed regions in Brazil, but is also one of the most important places on the planet for biodiversity, climate and geochemical cycles.

The researchers' analysis revealed that the quality of local people's lives –measured through levels of income, literacy and longevity, as mentioned above – increases quickly during the early stages of deforestation. This is probably because people capitalise on newly available natural resources, including timber, minerals and land for pasture, and higher incomes and new roads lead to improved access to education and medical care, and all round better living conditions.

However, the new results suggest that these improvements are transitory, and the level of development returns to below the national average once the area's natural resources have been exploited and the

deforestation frontier expands to virgin land. Quality of life pre- and post-deforestation was both substantially lower than the Brazilian national average, and was indistinguishable from one another.

Ana Rodrigues, lead author of the study, previously at the University of Cambridge and currently at the Centre of Functional and Evolutionary Ecology, France, said: "The Amazon is globally recognised for its unparalleled natural value, but it is also a very poor region. It is generally assumed that replacing the forest with crops and pastureland is the best approach for fulfilling the region's legitimate aspirations to development. This study tested that assumption. We found although the deforestation frontier does bring initial improvements in income, life expectancy, and literacy, such gains are not sustained."

Fellow author Dr Rob Ewers from Imperial College London's Department of Life Sciences adds: "The 'boom' in development that deforestation brings to these areas is clear, but our data show that in the long run these benefits are not sustained. Along with environmental concerns, this is another good reason to restrict further deforestation in the Amazon," he says. "However, in areas that are currently being deforested, the process needs to be better managed to ensure that for local people boom isn't necessarily followed by 'bust'."

The decline in development which occurs once an area has been deforested is likely due to the depletion of the natural resources that supported the initial boom. Timber is exhausted and land used for cattle ranching and farming is often rapidly degraded, leading to large scale abandonment – for example, by the early 1990s, one third of the area used for pastures had already been abandoned. This is compounded by an increasing human population as migrants including ranchers, farmers, colonists, landless peasants, gold miners, loggers, and land grabbers arrive, lured to the area by the prospect of rapid financial gain.

Andrew Balmford, co-author of the study and University of Cambridge Professor of Conservation Science, concluded: "The current boom-and-bust trajectory of Amazonian development is therefore undesirable in human terms as well as potentially disastrous for other species, and for the world's climate. Reversing this pattern will hinge on capturing the values of intact forests to people outside the Amazon so that local people's livelihoods are better when the forest is left standing than when it is cleared.

"This will be extremely difficult, both financially and practically. But discussions being held in the run-up to this December's crucial climate change meeting in Copenhagen about richer countries paying ones such as Brazil to retain the carbon stored in their forests offer some promise that this lose-lose-lose situation could be tackled, to the benefit of everyone - local Brazilians included."

The research was led by the University of Cambridge, in collaboration with Imperial College London, the University of East Anglia, CNRS, France, Instituto Superior Tecnico, Portugal, and IMAZON – the Amazon Institute of People and the Environment, Brazil.

The research has been funded by the European Community's 6th Framework Programme, the Fundacao para a Ciencia e Tecnologia (Portugal), the Gordon and Betty Moore Foundation (USA), and the Leverhulme Trust (UK).

Journal reference:

1. Ana S. L. Rodrigues et al. **Boom-and-bust development patterns across the Amazon deforestation frontier**. *Science*, 12 June 2009

Adapted from materials provided by [University of Cambridge](#), via [EurekAlert!](#), a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090611142358.htm>

Is The Sky The Limit For Wind Power? High-flying Kites Could Light Up New York



Kite-like turbines like these depicted in illustration could generate electricity from strong high-altitude winds. (Credit: Image by Ben Shepard courtesy Sky WindPower.)

ScienceDaily (June 16, 2009) — In the future, will wind power tapped by high-flying kites light up New York? A new study by scientists at the Carnegie Institution and California State University identifies New York as a prime location for exploiting high-altitude winds, which globally contain enough energy to meet world demand 100 times over. The researchers found that the regions best suited for harvesting this energy match with population centers in the eastern U.S. and East Asia, but fluctuating wind strength still presents a challenge for exploiting this energy source on a large scale.

Using 28 years of data from the National Center for Environmental Prediction and the Department of Energy, Ken Caldeira of the Carnegie Institution's Department of Global Ecology and Cristina Archer of California State University, Chico, compiled the first-ever global survey of wind energy available at high altitudes in the atmosphere. The researchers assessed potential for wind power in terms of "wind power density," which takes into account both wind speed and air density at different altitudes.

"There is a huge amount of energy available in high altitude winds," said coauthor Ken Caldeira. "These winds blow much more strongly and steadily than near-surface winds, but you need to go get up miles to get a big advantage. Ideally, you would like to be up near the jet streams, around 30,000 feet."

Jet streams are meandering belts of fast winds at altitudes between 20 and 50,000 feet that shift seasonally, but otherwise are persistent features in the atmosphere. Jet stream winds are generally steadier and 10 times faster than winds near the ground, making them a potentially vast and dependable source of energy. Several technological schemes have been proposed to harvest this energy, including tethered, kite-like wind turbines that would be lofted to the altitude of the jet streams. Up to 40 megawatts of electricity could be generated by current designs and transmitted to the ground via the tether.

"We found the highest wind power densities over Japan and eastern China, the eastern coast of the United States, southern Australia, and north-eastern Africa," said lead author Archer. "The median values in these areas are greater than 10 kilowatts per square meter. This is unthinkable near the ground, where even the best locations have usually less than one kilowatt per square meter."

Included in the analysis were assessments of high altitude wind energy for the world's five largest cities: Tokyo, New York, Sao Paulo, Seoul, and Mexico City. "For cities that are affected by polar jet streams such as Tokyo, Seoul, and New York, the high-altitude resource is phenomenal," said Archer. "New York, which has the highest average high-altitude wind power density of any U.S. city, has an average wind power density of up to 16 kilowatts per square meter."

Tokyo and Seoul also have high wind power density because they are both affected by the East Asian jet stream. Mexico City and Sao Paulo are located at tropical latitudes, so they are rarely affected by the polar jet streams and just occasionally by the weaker sub-tropical jets. As a result they have lower wind power densities than the other three cities.

"While there is enough power in these high altitude winds to power all of modern civilization, at any specific location there are still times when the winds do not blow," said Caldeira. Even over the best areas, the wind can be expected to fail about five percent of the time. "This means that you either need back-up power, massive amounts of energy storage, or a continental or even global scale electricity grid to assure power availability. So, while high-altitude wind may ultimately prove to be a major energy source, it requires substantial infrastructure."

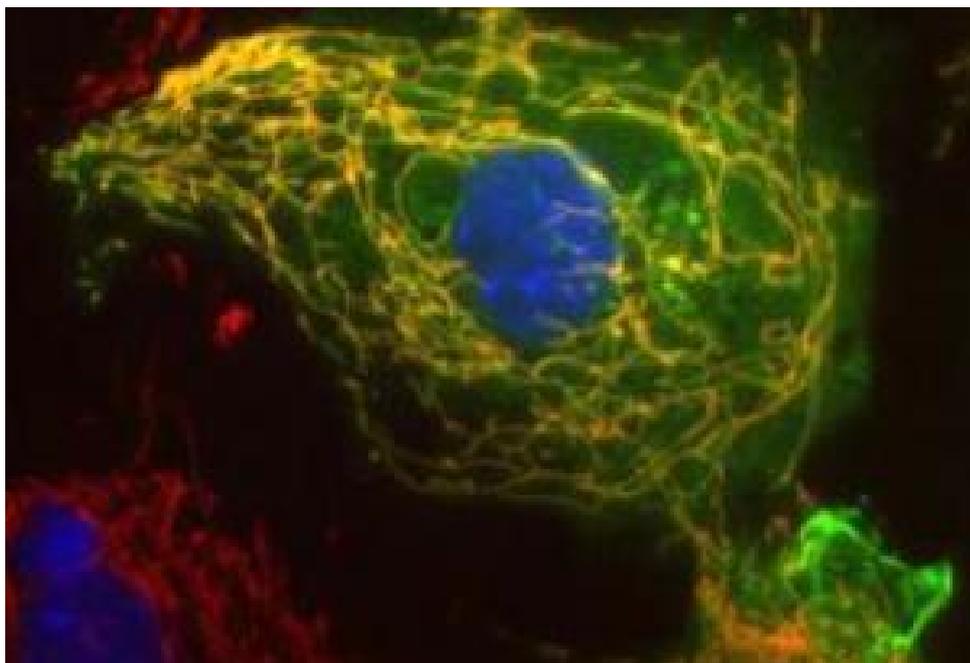
Journal reference:

1. Archer et al. **Global Assessment of High-Altitude Wind Power**. *Energies*, 2009; 2 (2): 307
DOI: [10.3390/en20200307](https://doi.org/10.3390/en20200307)

Adapted from materials provided by [Carnegie Institution](http://www.carnegie.org).

<http://www.sciencedaily.com/releases/2009/06/090615102038.htm>

Protein Regulates Movement Of Mitochondria In Brain Cells



Scientists have identified a protein in the brain that plays a key role in the function of mitochondria -- the part of the cell that supplies energy, supports cellular activity, and potentially wards off threats from disease. (Credit: Image courtesy of University of Rochester Medical Center)

ScienceDaily (June 16, 2009) — Scientists have identified a protein in the brain that plays a key role in the function of mitochondria – the part of the cell that supplies energy, supports cellular activity, and potentially wards off threats from disease. The discovery, which was reported June 15 in the *Journal of Cell Biology*, may shed new light on how the brain recovers from stroke.

"Understanding the molecular machinery that helps distribute mitochondria to different parts of the cell has only recently begun to be understood," said University of Rochester Medical Center neurologist David Rempe, M.D., Ph.D., the lead author of the study. "We know that in some disease states that mitochondria function is modified, so understanding how their activity is modulated is important to understanding how the brain responds to a pathological state."

Mitochondria are cellular power plants that generate most of the cell's supply of adenosine triphosphate (ATP), which is used as a source of chemical energy. While mitochondria are present in all of the body's cells, some cells – because of their size and purpose – need to transport mitochondria to distant sites within the cell to maintain proper function. A prominent example is neurons which have a complex cellular structure that consist of a main cell body and dendrites and axons that project out from the cell core and transmit signals to adjoining cells via synapses at their terminus.

"Neurons are at a disadvantage in terms of their anatomy," said Rempe. "They put out enormous arms of axons and dendrites and they have to keep supplying nutrients and everything down these arms. The supply line is very long."

The supply line includes mitochondria which the cell must also push down the axons and dendrites to provide these parts of the cell with energy, help with the transmission of signals, and generally maintain cellular health. Mitochondria are constantly cycling throughout the neuron. Some are stationary while others are moving down the arms of the cell to assume their proper position. Additionally, for reasons not completely understood, at any given time about half of the mobile mitochondria in the neuron are in the process of returning to the cell body – perhaps to be recycled or replenished in some form.

Rempe and his colleagues have discovered a protein that plays a critical role in regulating the movement – or transport – of mitochondria in neuron cells. The protein, which they dubbed hypoxia upregulated mitochondrial movement regulator (HUMMR), is produced in a state of low oxygen called hypoxia. HUMMR is induced by another protein called hypoxic inducible factor 1 alpha (HIF-1) which is responsible for triggering several processes in the cell that help it function in a low oxygen environment.

The primary role of HUMMR is to regulate the proper transport and distribution of mitochondria throughout the cell, essentially ensuring that they are in the correct position. One of the ways that the University of Rochester team was able to determine this is that when HUMMR was expressed at lower than normal levels, they observed that a greater number of the mitochondria began to abandon their posts along the cell's dendrites and axon and return to the cell body proper.

Understanding the mechanisms that regulate the movement of mitochondria may help scientists identify how the brain's cells ward off and potentially repair damage. An example is the role that mitochondria play as a calcium buffer. One of the mitochondria's functions is to help control the concentration of calcium in the cell, which the organelles can rapidly absorb and store. This capacity is important, particularly in instances when calcium levels in the cell spike during a stroke, a condition which contributes a cascading series of events that ultimately lead to a state called excitotoxicity and cell death.

One of the keys to identifying the function of HUMMR has been the appreciation in that the body operates at a relatively low oxygen level. While the air we breath consists of approximately 20% oxygen, the cells in the brain sit at somewhere between 2-5% oxygen. This creates a "normal" state of hypoxia in the brain.

However, the concentration of oxygen in the brain can drop even further in instances such as a stroke, when blood flow to a portion of the brain is cut off. This decrease in oxygen promotes the expression of HUMMR which, in turn, mobilizes mitochondria. More mitochondria in the correct position may mean the cell has a greater capacity to filter out toxic levels of calcium. Rempe and his colleagues are now investigating the role that HUMMR may play in stroke models, particularly whether or not this activity helps protect vulnerable cells that lie just outside the core areas of the brain that are damaged by stroke.

"Ultimately, these advances in our understanding of the molecular and cell biology of mitochondria have the potential to lead to novel approaches for the prevention and treatment of neurological disorders," said Rempe.

Co-authors include URM researches Li Yan, MS, and David Hoffman, D.M.D., Howard Federoff, M.D., Ph.D., and Seung Lim, Ph.D. with Georgetown University, and Pontus Aspenstrom, Ph.D. with the Karolinska Institute in Stockholm, Sweden. The study was funded, in part, by the National Institute of Neurological Disorders and Stroke.

Adapted from materials provided by [University of Rochester Medical Center](http://www.urochester.edu).

<http://www.sciencedaily.com/releases/2009/06/090615093925.htm>



Do And Don't Of Building In Hurricane-prone Areas

ScienceDaily (June 16, 2009) — Better building practices for structures in hurricane-prone regions will be the focus of a paper next month in Caribbean Construction Magazine by NJIT architecture professor Rima Taher, PhD. Taher has written extensively about best building design and construction practices to reduce wind pressures on building surfaces and to resist high winds and hurricanes in residential or commercial construction.

She is a civil/structural engineer who teaches at NJIT's College of Architecture and Design. Her courses include topics related to wind and earthquakes with guidelines and recommendations for better design and construction in hurricane and earthquake prone areas. Taher also helps prepare architecture graduates for the certifying exam and has authored a book on the topic. In 2007, her article about the design of low-rise buildings for extreme wind events appeared in the Journal of Architectural Engineering.

"Certain home shapes and roof types can make a big difference," is a common refrain in all her work.

Her recommendations in the forthcoming article should be heeded by anyone building in high wind regions. They include the following.

Design buildings with square, hexagonal or even octagonal floor plans with roofs of multiple slopes such as a four-sloped hip roof. These roofs perform better under wind forces than the gable roofs with two slopes. Gable roofs are common only because they are cheaper to build. Research and testing demonstrate that a 30-degree roof slope will have the best results.

Wind forces on a roof tend to uplift it. "This explains why roofs blow off during extreme wind events," Taher said. To combat uplift, she advises connecting roofs to walls strongly with nails, not staples. Stapled roofs were banned in Florida after Hurricane Andrew. The use of hurricane clips is recommended. The choice of roofing is important. Different roofing systems perform differently under hurricane conditions. In tile roofs, loose tiles often become wind-borne debris threatening other structures.

Aim for strong connections between the structure and foundation. Structural failure-- one structural element triggering the collapse of another—can be progressive.

Hurricane shutters can protect glazing from wind-borne debris. Various designs are available.

Roof overhangs are subject to wind uplift forces which could trigger a roof failure. In the design of the hurricane-resistant home, the length of these overhangs should be limited to about 20 inches.

The design of the researched cyclonic home includes simple systems to reduce the local wind stresses at the roof's lower edges such as a notched frieze or a horizontal grid. Install the latter at the level of the gutters along the homes' perimeter.

An elevated structure on an open foundation reduces the risk of damage from flooding and storm-driven water. All foundation piles must be strengthened by bracing and should penetrate deep enough into the soil to reduce the risk of scour.

Adapted from materials provided by [New Jersey Institute of Technology](#), via [EurekAlert!](#), a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090615144213.htm>



Brain Energy Use Key To Understanding Consciousness

ScienceDaily (June 16, 2009) — High levels of brain energy are required to maintain consciousness, a finding which suggests a new way to understand the properties of this still mysterious state of being, Yale University researchers report.

At its simplest, consciousness can be defined as the ability to respond meaningfully to external stimuli. Most studies of consciousness have used imaging technology to try to pinpoint areas of brain activity during tasks such as memorization or problem solving.

There are two problems with such an approach, said Robert G. Shulman, Sterling Professor Emeritus of molecular biophysics and biochemistry at Yale and lead author of the paper, to be published this week in the online edition of the journal *Proceedings of the National Academy of Sciences*. First, functional magnetic resonance imaging has shown that many areas of the brain, not just one or two, are recruited during tasks such as memory tests and are scant help in studying the state of being conscious. Second, the amount of energy used in such tasks is minute, about one percent of baseline energy available to the brain.

"Neuroimaging has been looking at the tip of the iceberg," Shulman said. "We looked at the rest of the iceberg."

What is the other 99 percent of energy consumption doing?

Shulman and colleagues have proposed that it is needed to maintain a person in a state of consciousness. Heavily anesthetized people are known to show approximately 50 percent reductions in cerebral energy consumption. When the paws of lightly anesthetized rats with rather high baseline energy levels were stroked, fMRI signals were received in the sensory cortex and in many other areas of the brain. In heavily anesthetized rats the signal stopped at the sensory cortex. Both the total energy and the fMRI signals changed when the person or animal lost consciousness.

"What we propose is that a conscious person requires a high level of brain energy," Shulman said.

The finding has profound implications for our understanding of the connection between the brain and consciousness, Shulman said. "You can think of consciousness not as a property of the brain, but of the person."

Anesthesiologists consider a person to be in a behavioral state of consciousness when he or she can respond to simple stimuli. Properties of this state, such as the high energy and the delocalized fMRI signals, allow the person to perform the interconnected activities that make up our everyday lives. Shulman suggests that these more energetic properties of the brain support human behavior and should be considered when interpreting the much weaker signals that are typically recorded during fMRI studies.

Other Yale researchers involved in the study are professors Fahmeed Hyder and Douglas L. Rothman.

The study was funded by the National Institutes of Health.

Adapted from materials provided by [Yale University](http://www.yale.edu).

<http://www.sciencedaily.com/releases/2009/06/090615171517.htm>

Opera 'is music for the heart'

Listening to the right kind of music can slow the heart and lower blood pressure, a study has revealed.



Rousing operatic music, like Puccini's *Nessun Dorma*, full of crescendos and diminuendos is best and could help stroke rehabilitation, say the authors.

Music is already used holistically at the bedside in many hospitals.

Not only is it cheap and easy to administer, music has discernible physical effects on the body as well as mood, *Circulation* journal reports.

Music with a faster tempo increases breathing, heart rate and blood pressure, while slower-pace music does the reverse.

“ Music induces a continuous, dynamic - and to some extent predictable - change in the cardiovascular system ”

Lead researcher Dr Luciano Bernardi

Dr Luciano Bernardi and colleagues, from Italy's Pavia University, asked 24 healthy volunteers to listen to five random tracks of classical music and monitored how their bodies responded.

They included selections from Beethoven's Ninth Symphony, an aria from Puccini's *Turandot*, Bach's cantata No 169, *Va Pensiero* from *Nabucco* and *Libiam Nei Lieti Calici* from *La Traviata*.

Every musical crescendo - a gradual volume increase - "aroused" the body and led to narrowing of blood vessels under the skin, increased blood pressure and heart rate and increased respiratory rates.

Conversely, the diminuendos - gradual volume decreases - caused relaxation, which slowed heart rate and lowered blood pressure.

Swelling crescendos

The researchers tested out various combinations of music and silence on the volunteers and found tracks rich in emphasis that alternated between fast and slow, like operatic music, appeared to be the best for the circulation and the heart.

Verdi's arias, which follow music phrases that are 10 seconds long, appeared to synchronise perfectly with the natural cardiovascular rhythm.

“ The power of music is just incredible ”

Diana Greenman, chief executive of Music in Hospitals

Dr Bernadi said: "Music induces a continuous, dynamic - and to some extent predictable - change in the cardiovascular system.

"These findings increase our understanding of how music could be used in rehabilitative medicine."

Music in Hospitals is a UK-based charity that provides live music to hospitals, hospices and care and residential homes across the country. It was originally set up after World War II to help injured veterans.

Its chief executive, Diana Greenman, said: "We have seen enormous benefits in people who have had strokes or heart attacks. The power of music is just incredible.

"Music is holistic, but I hear time and again of stroke patients who suddenly are able to move in time to the music after previously being paralysed."

She said it was important to tailor the performance to the individual, since not all people appreciate the same music.

A spokesman for the Stroke Association said: "We have seen from previous pieces of research that a positive emotional state - that can be brought on from listening to music - can help stroke survivors.

"In fact, many of our support groups use music and singing techniques to aid stroke survivors' recoveries.

"We would therefore welcome further research into this particular study which could help benefit the 150,000 people affected by stroke each year."

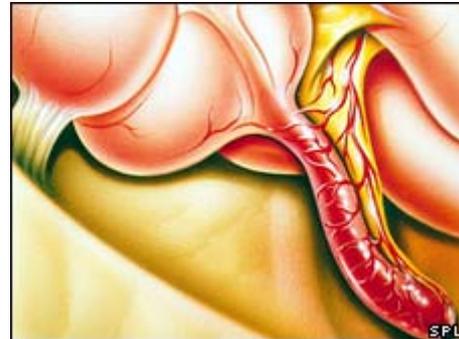
Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8112247.stm>

Published: 2009/06/22 23:02:48 GMT

Hope for appendicitis urine test

Scientists are hopeful of developing a simple urine test which will be able to detect appendicitis.



The condition may be life-threatening without emergency surgery, but can be difficult to diagnose, especially in younger people.

Now a team at the Children's Hospital Boston has pinpointed a protein in the urine which might be a tell tale sign of the condition.

The research features online in *Annals of Emergency Medicine*.

An easier way to detect appendicitis would represent a major breakthrough, reducing the risk of serious complications if it is missed, or of unnecessary surgery if it is wrongly diagnosed.

Despite improvements in imaging technology, recent figures suggest as many as 30% of children who undergo appendix removal do so unnecessarily, while up to 45% diagnosed with appendicitis already have a ruptured appendix.

Potential candidates

The Boston team used a technique called mass spectrometry to analyse 12 urine samples from children.

They identified 57 compounds associated with immune response and inflammation which might potentially be a sign of appendicitis.

APPENDICITIS

Inflammation of a small pouch connected to the colon

Can be caused by infection or obstruction - but in many cases the cause is unclear

Regarded as a medical emergency because a ruptured appendix can lead to potentially serious or even fatal complications, such as blood poisoning

Further tests carried out on 67 children seen at the hospital for suspected appendicitis narrowed the field to seven promising candidates.

The best of them was a protein called leucine-rich alpha-2-glycoprotein (LRG).

The researchers found that LRG levels were significantly elevated in diseased appendices - even those that appeared normal on scans.

They also found that the more severe the disease, the higher the level of LRG was.

The researchers accept that mass spectrometry is not widely available in hospitals, but they believe it might be possible to develop a rapid urine dipstick test for the protein.

Researcher Dr Richard Bachur said: "Recent diagnostic advances have focused on advanced radiologic procedures, such as computed tomography and ultrasound, but these resources are not universally available and can delay diagnosis.

"Although these advances have improved the diagnosis and decreased complications from appendicitis, CT scans also expose children to radiation that may increase the lifetime risk of cancer."

However, the researchers accept that their findings may only be relevant to children, and that patterns of tell tale biomarkers may vary in older patients.

They stress that more research on adults is needed.

Mimicking conditions

Mr Geoffrey Glazer, a consultant general surgeon based at London's Wellington Hospital, agreed that diagnosing appendicitis could pose problems.

"The problem for surgeons is that they would rather take out a lilywhite appendix than leave a bad one in," he said.

However, he said appendicitis often mimicked other inflammatory conditions, such as diverticulitis.

He said more work was required to determine not only whether LRG was a relevant marker for adults as well as children, but also whether it was specific to appendicitis, and not other related conditions.

Dr Anton Emmanuel, medical director of the digestive disorders charity Core, said the test, if proven to be useful in all populations, could potentially be very useful.

"The fact that this is a non-invasive test is also a big bonus. In time, it is likely to be one of a number of tests that will prove diagnostically useful in establishing whether or not there is appendicitis.

"The question is whether surgeons and patients will trust a negative result over a clinical impression."

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8112324.stm>

Published: 2009/06/22 23:03:12 GMT

'No proof' for filling baby teeth

By Michelle Roberts
BBC News health reporter

Filling rotten baby teeth may be an unnecessary trial for children to endure, experts say.



Some 40% of five-year-olds in the UK have tooth decay and at least one in 10 of these is treated with fillings. But anecdotal evidence from 50 dentists gathered by Manchester University researchers suggests filling baby teeth may not offer significant benefits.

Advisers to the NHS are now beginning a study on treatment options to provide dentists with clear guidelines. Experts already know there is wide variation in care which means that a young child with signs of tooth decay could have no treatment, a filling or the tooth pulled out depending on which dentist they attend.

“ At the moment there is no clear [treatment] winner and we do not know which is best to recommend ”

Dr Gail Topping University of Dundee

Without any clear guidelines, dentists currently have to rely on their experience and judgement to decide whether or not to intervene. If the child is in severe pain and having sleepless nights, and the parent is confident that their child will cope with and benefit from the treatment, then the choice may be clear.

But when the decay is not causing symptoms, it can be difficult to decide what is in the child's best interests given that their tooth will ultimately fall out by the time they are 11 anyway. Indeed, anecdotal evidence gathered from the case notes of 50 dentists suggests filling baby teeth may achieve nothing but expose children to the discomfort of an injection and the sound of the drill.

Dental phobia

Professor Martin Tickle, of the University of Manchester, found no difference in the numbers of extractions for pain or infection whether baby teeth had been filled or not.

And when he surveyed the parents of all five-year-olds living in Ellesmere Port and Chester in 2003, he found only 6% would want their child to have a filling if they had symptomless decay in a baby tooth.

“ You do not want to upset the child and make them phobic of future treatments ”

Kamini Shah British Association for the Study of Community Dentistry In comparison, a third would want the dentist to monitor the tooth but provide no treatment.

Experts working for the Health Technology Assessment Programme plan to recruit over 1,000 children from across the UK to take part a study that will compare the outcomes of three treatment options.

They are conventional drilling and filling, no fillings or a painless paint-on tooth treatment that merely seals and contains the decay. Lead investigator Dr Gail Topping, of the University of Dundee, said: "This is a really big question to answer.

"At the moment there is no clear winner and we do not know which is best to recommend. There is no guidance or mandate. "At the moment, dentists are doing what they believe is the right option for the child on a case by case basis." She said dentists would welcome evidence-based guidelines because the treatment decision can be a difficult one to make.

Softly, softly

Kamini Shah, dentist and honorary secretary of the British Association for the Study of Community Dentistry, said: "There are two schools of thought, one being that baby teeth can cause pain and sleepless nights and so dentists should fill.

"The other is that actually the evidence around filling baby teeth is questionable. "Sometimes you need to adopt a pragmatic approach rather than go in with all guns blazing. "If a child is very uncooperative but has a mouthful of non-symptomatic holes you might decide to apply a fluoride varnish to stabilise the disease rather than to do conventional fillings." Painted on with a small brush, the banana-flavoured varnish is totally painless and can slow or even stop the decay if applied often enough. Dr Shah said: "That way you gain the child's confidence and can work on prevention. You do not want to upset the child and make them phobic of future treatments.

"The problem arises when children come in aged three or four and it is their first experience of the dentist and it is because they are in pain.

"In that scenario you can well imagine that they might not be most cooperative." She said in extreme cases, and when the decay was so bad it necessitated treatment, a child might be referred for anxiety management or have the teeth removed under general anaesthetic.

Recently, an eight-year-old girl starved to death because of an apparently severe dental phobia.

Sophie Waller, from St Dennis in Cornwall, is thought to have been so traumatised by her phobia that she refused to open her mouth after having eight teeth removed under general anaesthetic.

The full trial will run for four years from 2011 across England, Scotland and Wales, with a feasibility study starting in the coming months.

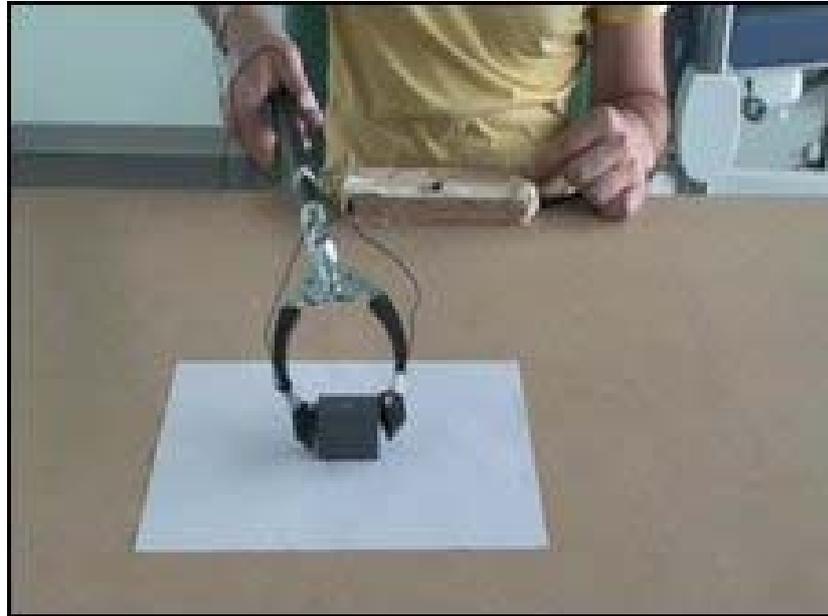
Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8112603.stm>

Published: 2009/06/22 23:02:28 GMT

Tools are 'temporary body parts'

The brain represents tools as extensions to the body, according to researchers writing in *Current Biology*.



After the use of a grasping tool, participants asked to grasp an object with their own hands did so more slowly and sluggishly.

Blindfolded participants also overestimated the length of their tool-using arm after the exercise.

The research seems to confirm a century-old hypothesis that the brain models tools as parts of the body.

"There is a great debate in neuroscience about the representation of the body and representation of space," said Lucilla Cardinali of the National Institute of Health and Medical Research (Inserm) in France.

"There are a lot of papers about the effects of tool use, but they all focus on space - none investigated the effect on our own body," she told BBC News.

Ms Cardinali and her colleagues tested that effect by giving participants a gripping tool, similar to the tool commonly used to pick up rubbish.

They had to use the tool to pick up and replace a small block. After just a few minutes of the task, they were then asked to pick up the block using their own hand, or to simply reach out and place a finger on top of the block.

“ This is the first unambiguous and definitive proof that using a tool modifies the representation of our body ”

Lucilla Cardinali Inserm

The team found that the participants' performance was noticeably different in carrying out those tasks than they had been before using the tool.

They accelerated and decelerated their movements more slowly, taking a longer time overall - which the team attributes to adjustments the participants needed to make in the absence of the tool.

Long thought

More telling, however, was an experiment performed with the participants blindfolded after the tool use.

After an experimenter touched the participants' elbow and middle fingertip, they were asked to point using the other hand to those two locations.

After a session of using the tool, the participants indicated locations further apart than before tool use: they seemed to perceive the tool-using arm as longer.

"This is the first unambiguous and definitive proof that using a tool modifies the representation of our body; previous studies suggested this but never proved it directly," Ms Cardinali said.

Patrick Haggard of the Institute of Cognitive Neuroscience at University College London, UK, said that the study contrasted with prior work that concentrated on the perception of space, rather than the body performing an action in that space.

"Previous studies had shown that using tools changes the way humans and animals perceive external space, bringing far-away objects into reach," he told BBC News.

"Neuroscientists have known for a long time that the brain's map of the body is not static: in fact, the brain needs to adjust to the changes in our body that occur with growth, ageing, and traumas such as amputation or injury.

"But this paper shows how rapid these adjustments are."

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8112873.stm>

Published: 2009/06/22 16:01:26 GMT

Human role in big kangaroo demise

By Jason Palmer
Science and technology reporter, BBC News

A fossil study of the extinct giant kangaroo has added weight to the theory that humans were responsible for the demise of "megafauna" 46,000 years ago.



The decline of plants through widespread fire or changes toward an arid climate have also played into the debate about the animals' demise.

But an analysis of kangaroo fossils suggested they ate saltbush, which would have thrived in those conditions.

The research is in Proceedings of the National Academy of Sciences.

There has long been dissent in the palaeontology community about the cause for extinctions worldwide after the end of the last ice age.

Central to the debate has been the demise of the Australian megafauna, including animals such as marsupial lions, hippopotamus-sized wombats and the 2m-tall giant kangaroo *Procoptodon goliath*.

Last year, researchers dated fossils from Tasmania with the best precision yet, finding that many species survived more than 2,000 years after the arrival of humans.

The researchers concluded that the megafauna eventually met their end due to hunting.

Dental exam

Now, researchers from Australia and the US have combined radiocarbon dating with a so-called microwear analysis of the teeth of *P. goliath* to determine what it ate and drank.

Different sources of water and food leave trace amounts of particular types, or isotopes, of hydrogen and carbon atoms, which are deposited in the teeth like a recorded diet.

Additionally, tiny patterns of wear give clues about the type of food a given creature chewed.

The team concluded that the giant kangaroos fed mainly on saltbush shrubs.

Because fire does not propagate well among saltbush, and because it thrives in a dry, arid climate, the case supporting two of the three potential causes for extinction was weakened.

Evidence suggests therefore that the *P. goliath* was hunted to extinction.

However, it is just one of many species whose disappearance fuels the debate, and there is much more work to be done before it can be considered a definitive proof.

"I'm a little hesitant to make a big conclusion," said co-author of the study, Larisa DeSantis of the University of Florida.

"What's really exciting is that this is one of the first instances where we've been able to use both isotopes and the microwear method to identify this very unique diet," she told BBC News.

Dr DeSantis said that she was pursuing a similar analysis of other megafauna fossils in other regions of Australia.

"This study neatly ties up several loose threads in the long-running extinction debate," said Richard Roberts of the University of Wollongong in Australia.

"By independently reaching the same conclusion for two very different environments - the mountainous rainforests of Tasmania and the dry rangelands of inland Australia - the mystery is no longer whether humans were ultimately responsible for the disappearance of the giant marsupials, but how they did it."

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8112885.stm>

Published: 2009/06/22 21:25:18 GMT

Firms urged to give fathers time

Children's Secretary Ed Balls is calling on employers to make more time for fathers, so they can be more involved in their children's lives.



He wants firms to be aware fathers may need to take special leave when a child is sick or to attend a school event.

The call comes as a poll of 500 fathers shows three quarters want information relevant to them as well as mothers.

And 77% want public services to open longer so they can learn about and contribute to their child's welfare.

Mr Balls is due to chair a summit to discuss fatherhood at Westminster on Tuesday morning.

'Equal role'

It is part of his department's 'Think Fathers' campaign which aims to encourage public services to recognise the role fathers can play in children's lives.

Research suggests that if fathers are involved in their children's lives at the age of seven, they will do better at school.

The ICM poll of 500 fathers suggests today's fathers want to play an increasing role in their children's health and education but find it difficult to do so.



Some 77% would like to see mothers and fathers equally involved in parenting rather than one being the main carer.

The poll showed younger fathers in particular were unhappy with the health and education services.

'Sidelined'

Only 41% were happy with their involvement with schools, while 74% thought information on children's services was more geared towards mothers than fathers.

Adrienne Burgess, research manager at think-tank Fatherhood Institute, which commissioned the poll, said: "The fact that the younger generation of Dads are more involved with services yet less happy with the level of their involvement and with the way services treat them, doesn't mean services are getting worse: it means that the expectations of today's fathers are changing.

"They're more ambitious to play a greater role, and more upset and undermined when they're sidelined.

"Services, and employers, need to take this new mood among Dads on board so they can be fully hands on with their children.

"Fathers want it; mothers want it; children want it. And society needs it."

Story from BBC NEWS:

http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/education/8113620.stm

Published: 2009/06/22 23:09:13 GMT



A Wandering Mind Heads Straight Toward Insight

Researchers Map the Anatomy of the Brain's Breakthrough Moments and Reveal the Payoff of Daydreaming

By ROBERT LEE HOTZ

It happened to Archimedes in the bath. To Descartes it took place in bed while watching flies on his ceiling. And to Newton it occurred in an orchard, when he saw an apple fall. Each had a moment of insight. To Archimedes came a way to calculate density and volume; to Descartes, the idea of coordinate geometry; and to Newton, the law of universal gravity.

Eureka Moments
Five light-bulb moments of understanding that revolutionized science.

In our fables of science and discovery, the crucial role of insight is a cherished theme. To these epiphanies, we owe the concept of alternating electrical current, the discovery of penicillin, and on a less lofty note, the invention of Post-its, ice-cream cones, and Velcro. The burst of mental clarity can be so powerful that, as legend would have it, Archimedes jumped out of his tub and ran naked through the streets, shouting to his startled neighbors: "Eureka! I've got it."

In today's innovation economy, engineers, economists and policy makers are eager to foster creative thinking among knowledge workers. Until recently, these sorts of revelations were too elusive for serious scientific study. Scholars suspect the story of Archimedes isn't even entirely true. Lately, though, researchers have been able to document the brain's behavior during Eureka moments by recording brain-wave patterns and imaging the neural circuits that become active as volunteers struggle to solve anagrams, riddles and other brain teasers.

Journal Community

Discuss: What's your Eureka moment?

Following the brain as it rises to a mental challenge, scientists are seeking their own insights into these light-bulb flashes of understanding, but they are as hard to define clinically as they are to study in a lab. To be sure, we've all had our "Aha" moments. They materialize without warning, often through an unconscious shift in mental perspective that can abruptly alter how we perceive a problem. "An 'aha' moment is any sudden comprehension that allows you to see something in a different light," says psychologist John Kounios at Drexel University in Philadelphia. "It could be the solution to a problem; it could be getting a joke; or suddenly recognizing a face. It could be realizing that a friend of yours is not really a friend."

These sudden insights, they found, are the culmination of an intense and complex series of brain states that require more neural resources than methodical reasoning. People who solve problems through insight generate different patterns of brain waves than those who solve problems analytically. "Your brain is really working quite hard before this moment of insight," says psychologist Mark Wheeler at the University of Pittsburgh. "There is a lot going on behind the scenes."

Recommended Reading
Daydreaming is more demanding than it seems, researchers reported in "Experience Sampling During fMRI Reveals Default Network and Executive System Contributions to Mind Wandering" in Proceedings of The National Academy of Sciences.

A positive mood makes an insight more likely, Northwestern University researchers reported in "A Brain Mechanism for Facilitation of Insight by Positive Affect" in the March edition of Journal of Cognitive Neuroscience.

In the journal *Neuropsychologia*, Drexel University scientists reported on "The Origins of Insight in Resting State Brain Activity."

Together, the two research teams reported that people who solved problems through insight had different brain wave patterns than people who don't. In *PLoS Biology*, they documented "Neural Activity When People Solve Verbal Problems with Insight" and the "Neural Basis of Solving Problems with Insight." At the University of London's Goldsmith College, researchers reported in the *Journal of Cognitive Neuroscience* that brain waves heralding an insight can be detected 8 seconds before we become conscious of it.

In fact, our brain may be most actively engaged when our mind is wandering and we've actually lost track of our thoughts, a new brain-scanning study suggests. "Solving a problem with insight is fundamentally different from solving a problem analytically," Dr. Kounios says. "There really are different brain mechanisms involved."

By most measures, we spend about a third of our time daydreaming, yet our brain is unusually active during these seemingly idle moments. Left to its own devices, our brain activates several areas associated

with complex problem solving, which researchers had previously assumed were dormant during daydreams. Moreover, it appears to be the only time these areas work in unison.

"People assumed that when your mind wandered it was empty," says cognitive neuroscientist Kalina Christoff at the University of British Columbia in Vancouver, who reported the findings last month in the Proceedings of the National Academy of Sciences. As measured by brain activity, however, "mind wandering is a much more active state than we ever imagined, much more active than during reasoning with a complex problem."

She suspects that the flypaper of an unfocused mind may trap new ideas and unexpected associations more effectively than methodical reasoning. That may create the mental framework for new ideas. "You can see regions of these networks becoming active just prior to people arriving at an insight," she says.

In a series of experiments over the past five years, Dr. Kounios and his collaborator Mark Jung-Beeman at Northwestern University used brain scanners and EEG sensors to study insights taking form below the surface of self-awareness. They recorded the neural activity of volunteers wrestling with word puzzles and scanned their brains as they sought solutions.

Some volunteers found answers by methodically working through the possibilities. Some were stumped. For others, even though the solution seemed to come out of nowhere, they had no doubt it was correct. In those cases, the EEG recordings revealed a distinctive flash of gamma waves emanating from the brain's right hemisphere, which is involved in handling associations and assembling elements of a problem. The brain broadcast that signal one-third of a second before a volunteer experienced their conscious moment of insight -- an eternity at the speed of thought.

The scientists may have recorded the first snapshots of a Eureka moment. "It almost certainly reflects the popping into awareness of a solution," says Dr. Kounios.

In addition, they found that tell-tale burst of gamma waves was almost always preceded by a change in alpha brain-wave intensity in the visual cortex, which controls what we see. They took it as evidence that the brain was dampening the neurons there similar to the way we consciously close our eyes to concentrate.

"You want to quiet the noise in your head to solidify that fragile germ of an idea," says Dr. Jung-Beeman at Northwestern.

At the University of London's Goldsmith College, psychologist Joydeep Bhattacharya also has been probing for insight moments by peppering people with verbal puzzles.

By monitoring their brain waves, he saw a pattern of high frequency neural activity in the right frontal cortex that identified in advance who would solve a puzzle through insight and who would not. It appeared up to eight seconds before the answer to a problem dawned on the test subject, Dr. Bhattacharya reported in the current edition of the Journal of Cognitive Neuroscience.

"It's unsettling," says Dr. Bhattacharya. "The brain knows but we don't."

So far, no one knows why problems sometimes trigger an insight or what makes us more inclined to the Eureka experience at some moments but not at others. Insight does favor a prepared mind, researchers determined.

Even before we are presented with a problem, our state of mind can affect whether or not we will likely resort to insightful thinking. People in a positive mood were more likely to experience an insight, researchers at Drexel and Northwestern found. "How you are thinking beforehand is going to affect what you do with the problems you get," Dr. Jung-Beeman says.

By probing the anatomy of 'aha,' researchers hope for clues to how brain tissue can manufacture a new idea. "Insight is crucial to intellect," Dr. Bhattacharya says.

Taken together, these findings highlight a paradox of mental life. They remind us that much of our creative thought is the product of neurons and nerve chemistry outside our awareness and beyond our direct control.

"We often assume that if we don't notice our thoughts they don't exist," says Dr. Christoff in Vancouver, "When we don't notice them is when we may be thinking most creatively."

Robert Lee Hotz shares recommended reading on this topic and responds to reader comments at WSJ.com/Currents. Email him at sciencejournal@wsj.com.

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<http://online.wsj.com/article/SB124535297048828601.html>

Email patterns can predict impending doom

- 22 June 2009 by **Jim Giles**
- Magazine issue 2713.



EMAIL logs can provide advance warning of an organisation reaching crisis point. That's the tantalising suggestion to emerge from the pattern of messages exchanged by Enron employees.

After US energy giant Enron collapsed in December 2001, federal investigators obtained records of emails sent by around 150 senior staff during the company's final 18 months. The logs, which record 517,000 emails sent to around 15,000 employees, provide a rare insight into how communication within an organisation changes during stressful times.

Ben Collingsworth and Ronaldo Menezes at the Florida Institute of Technology in Melbourne identified key events in Enron's demise, such as the August 2001 resignation of CEO Jeffrey Skilling. They then examined the number of emails sent, and the groups that exchanged the messages, in the period around these events. They did not look at the emails' content.

Menezes says he expected communication networks to change during moments of crisis. Yet the researchers found that the biggest changes actually happened around a month before. For example, the number of active email cliques, defined as groups in which every member has had direct email contact with every other member, jumped from 100 to almost 800 around a month before the December 2001 collapse. Messages were also increasingly exchanged within these groups and not shared with other employees.

Menezes thinks he and Collingsworth may have identified a characteristic change that occurs as stress builds within a company: employees start talking directly to people they feel comfortable with, and



stop sharing information more widely. They presented their findings at the International Workshop on Complex Networks, held last month in Catania, Italy.

Gilbert Peterson at the Air Force Institute of Technology in Dayton, Ohio, has also worked with the Enron emails. He says that if further research backs up Menezes's idea, this shift in communication patterns could be used as an early warning sign of growing discontent within an organisation. "Human resources folk would probably find this extremely useful," he says.

Confirming this link will be difficult, though, as privacy concerns mean that email logs are hardly ever made public. Menezes says his university will not allow him to analyse even an anonymised version of student email data.

Such restrictions are frustrating for researchers who study social networks, as they had hoped email logs might boost the field by providing unprecedented quantitative data on how people communicate.

A few other studies have been carried out, however. Duncan Watts of Yahoo Research in New York managed to obtain anonymised university email records - though he is not able to share them with others - and used them to show that instead of varying continuously, individuals' emailing behaviour falls into distinct clusters. Meanwhile, Peterson used the Enron email log to develop software that scans for potential saboteurs working within an organisation.

<http://www.newscientist.com/article/mg20227135.900-email-patterns-can-predict-impending-doom.html?DCMP=OTC-rss&nsref=online-news>





Children: Self-Control Presages Math Gains in Young

By NICHOLAS BAKALAR

A simple five-minute behavioral test for children entering kindergarten can predict significant gains in mathematics skills over the course of the year, researchers have found.

Claire Cameron Ponitz, a research associate at the University of Virginia, led a group that tested 343 children with the Head-Toes-Knees-Shoulders task, in which children perform the opposite of an oral command (for example, the correct response for “touch your toes” would be to touch your head). Higher scores, the researchers write in the May issue of Developmental Psychology, indicate a greater ability to control and direct one’s own behavior, an ability essential for success in the structured environment of a kindergarten class.

Those with higher scores on the fall test generally reached higher scores in all areas in the spring, but showed significant gains compared with other children only in mathematics, not in literacy or vocabulary.

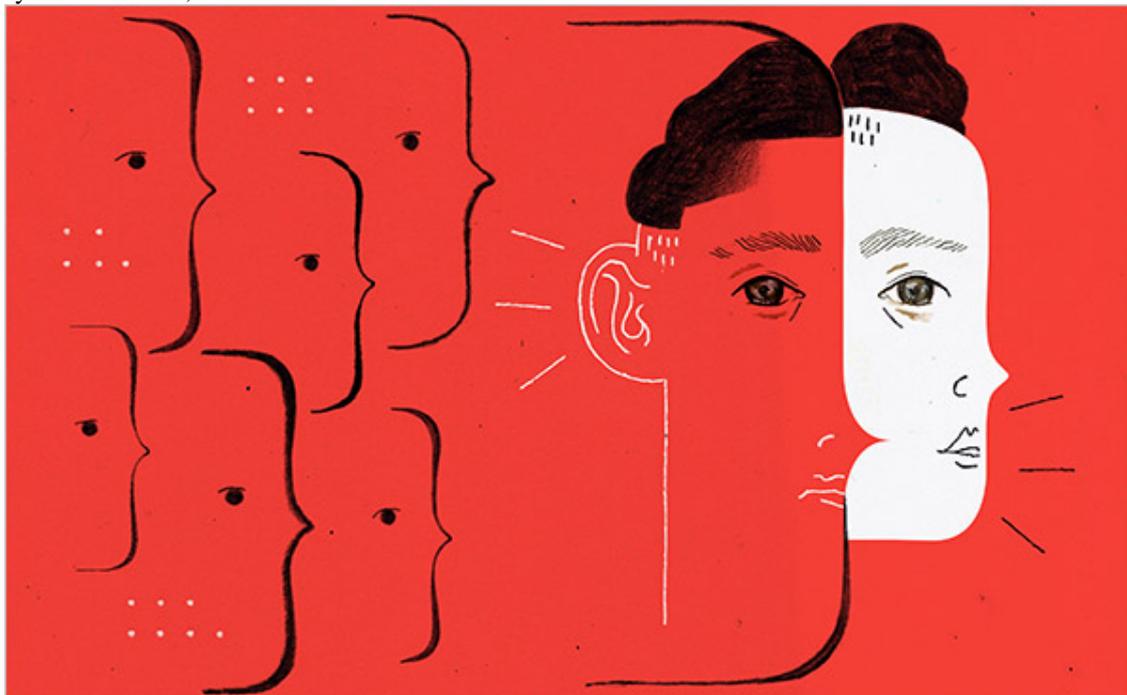
What’s a parent to do? “We know that consistency and giving children opportunities to control their own behavior helps them develop self-regulation skills,” Dr. Ponitz said. “Playing games like red light, green light, or following through with consequences for violations of family rules — these are things that have been shown to be related to self-regulation in early childhood.”

<http://www.nytimes.com/2009/06/23/health/research/23chil.html?nl=health&emc=a3>



Where Can the Doctor Who's Guided All the Others Go for Help?

By ELISSA ELY, M.D.



Psychiatry is a relatively safe profession, but it has a hazard that is not apparent at first glance: if you are in it long enough, there may be no one to talk to about your own problems.

It is not that way when you start out. Most psychiatric residents spend a good deal of time in therapy with a senior psychiatrist, for a number of reasons — not least, that it is the most intimate way to learn technical magic. Books teach the same thing to everyone who reads them. But no one forgets the crystalline remark their therapist made just to them, and how they viewed themselves differently ever after.

At a certain point, though, you stop being the student and become the teacher. You settle into the details of a career — hospital, research, private practice. Roots go down, time passes. Eventually, younger psychiatrists begin to approach you. Now *you* are the generation above, saving early-morning slots for residents before they head off to clinic and class. You lower fees and accommodate their hurtling, insane schedules. You remember how it was.

But no amount of wisdom prevents personal frailty. You are never too old for your own problems. Yet when you are the professional others go to, where do you bring your sorrows and secret pain?

Sometimes the situation is clear. During my training there was a formidable psychiatrist who disappeared periodically. Everyone knew she was being hospitalized for a recurrent manic psychosis, and that she would be back to intimidate the trainees as soon as medications had stabilized her.

There was an oddness about it, but no dishonor. Actually, her illness made her more impressive. We are taught to explain that mental illness has a biological component responsive to medical treatment, just like diabetes or heart disease. Her example brought conviction to our tone.



In my residency, I moonlighted in a medication clinic where an elderly psychiatrist was being treated for a dementia he did not recognize. He could not remember simple requests, raised his cane to strangers, screamed at family members; his wife met with me separately and told me she was ready to leave him.

Carefully writing “Dr.” on the top line of each of his prescriptions, I felt undersized and overregarded. Yet he took the pills without question and showed a fatherly interest in my career. Years later, I thought maybe his wife had chosen a student deliberately. My junior status allowed him to maintain his senior status.

Often, though, the situation is not straightforward, and medication is not the problem. Life is. Maybe we are overcome, maybe ashamed, maybe despairing. Self-revelation — the nakedness necessary in therapy — is hard when you have been a model to others.

“In my situation, it would be difficult to find someone,” Dr. Dan Buie, a beloved senior analyst in Boston, told me. It is not that psychiatrists aren’t waiting in wing chairs all over the city. It is that so many of them are former students and former patients. One generation of psychiatrists grows the next through teaching and treatment.

Surrendering that professional identity to become a patient reverses a kind of natural order. “You can’t be a simple patient,” Dr. Buie said. “Anyone I’d go to, I’ve known.” To avoid it, some travel to other cities for therapy (probably passing colleagues in trains heading in the other direction).

There is also the factor of experience. It is one thing if my internist is younger than I; she is closer to the bones of medicine, and with any luck we can get to know each other for years before serious illness requires more intimate contact. It is another thing if my therapist is younger than I.

“It would be a big mistake not to turn to someone,” Dr. Buie went on, “but I might have some trouble going to younger colleagues. It’s hard to understand the issues that come up in the course of a life cycle unless you’ve lived it yourself.” Dr. Rachel Seidel, a psychoanalyst and psychiatrist in Cambridge, said that when people feel vulnerable, “we want someone with more insight than we have.”

“It’s a paradox,” she added. “Do I have to have gone through what you’ve gone through in order to be empathic to you? And yet, I’d have a preference for someone who’s been around longer.”

Some look laterally for help. Peer supervision is a well-known form of risk management; presenting troubling professional cases to colleagues prevents folly and mistakes at any age.

“I use a couple of peers,” said Dr. Thomas Gutheil, professor of psychiatry at Harvard Medical School. “Then they use me. It’s the reciprocity that’s key — you feel the comfort of telling everything about yourself when you know the reverse is also true.”

Other solutions are even closer. The playwright Edward Albee once wrote that it can be necessary to travel a long distance out of the way in order to come back a short distance correctly. The best source of help can be the nearest source of all. An elderly luminary at the Boston Psychoanalytic Society and Institute listened without comment when asked: Whom does he — the doctor others seek out for help — seek out for help himself? He wasted no words.

“My wife,” he said crisply.

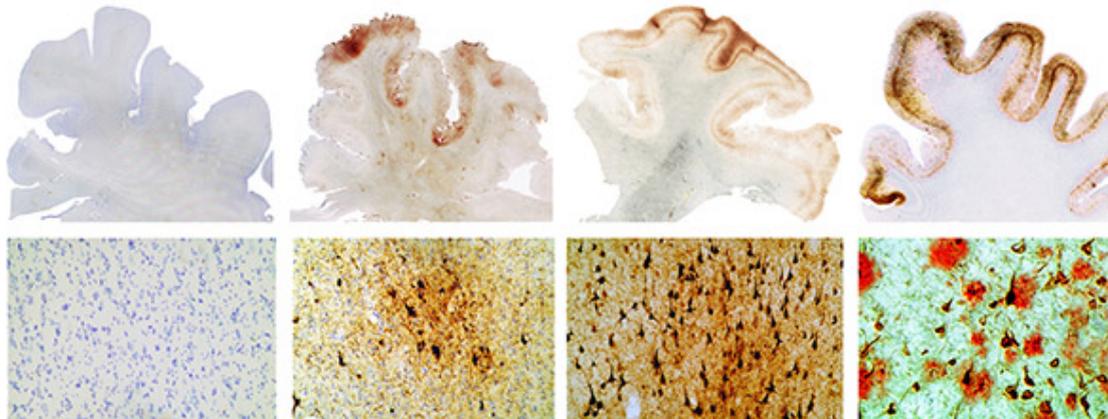
Elissa Ely is a psychiatrist in Boston.

<http://www.nytimes.com/2009/06/23/health/23mind.html?nl=health&emc=a1>



A Chance for Clues to Brain Injury in Combat Blasts

By ALAN SCHWARZ



No direct impact caused Paul McQuigg's brain injury in Iraq three years ago. And no wound from the incident visibly explains why Mr. McQuigg, now an office manager at a California Marine base, can get lost in his own neighborhood or arrive at the grocery store having forgotten why he left home.

But his blast injury — concussive brain trauma caused by an explosion's invisible force waves — is no less real to him than a missing limb is to other veterans. Just how real could become clearer after he dies, when doctors slice up his brain to examine any damage.

Mr. McQuigg, 32, is one of 20 active and retired members of the military who recently agreed to donate their brain tissue upon death so that the effects of blast injuries — which, unlike most concussions, do not involve any direct contact with the head — can be better understood and treated.

The research will be conducted by the Sports Legacy Institute, a nonprofit organization based in Waltham, Mass., and by the Boston University Center for the Study of Traumatic Encephalopathy, whose recent examination of the brains of deceased football players has found damage linked to cognitive decline and depression.

Whether single, non-impact blasts in battle can cause the same damage as the years of repetitive head bashing seen in football is of particular interest to researchers. The damage, primarily toxic protein deposits and tangled brain fibers, cannot be detected through noninvasive procedures like M.R.I.'s and CT scans.

"We don't know much about the medium- or long-term effects of head trauma experienced by our military," said Robert Stern, co-director of the Boston University center as well as its Alzheimer's Disease Clinical and Research Program. "We know that there are some immediate effects in terms of blast injury on cognition and behavior. But we do not yet know whether there are any long-term effects."

"Does that single blow result in something that doesn't go away," he added, "or perhaps sets off a cascade of events that leads to a progressive degenerative brain disease?"

Mr. McQuigg may be finding out the cruelest way. In February 2006, he was on combat patrol when his Humvee was hit by a roadside bomb, knocking him unconscious, shattering his jaw and damaging his right eye. His helmet could not protect him from a severe concussion that doctors told him was caused solely by the bomb's force waves, not direct impact.

Now he is experiencing headaches, short-term memory problems and trouble with balance that have only worsened.

“With prosthetics, you can replace an arm or a leg and can still throw a football with your kid,” said Mr. McQuigg, who works at Camp Pendleton, north of San Diego. “If you have a severe brain injury, you might not be able to live on your own.”

“And people don’t know what’s wrong with you,” he added. “People know if you’re missing an arm, something happened. If it happened to your brain, they can’t tell.”

An estimated 320,000 soldiers have experienced some form of traumatic brain injury during their service in Iraq or Afghanistan, according to a 2008 RAND Corp. study. Blast injuries have risen in prominence in recent years because improvements in armor and medical treatment allow soldiers to survive explosions, then experience any delayed effects.

Blast injuries result from waves of air pressure that can travel several times as fast as hurricane winds. Those waves can not only throw a soldier dozens of feet in the air into other objects — causing a conventional concussion as the brain crashes inside the skull — but may also subject brain tissue to sudden pressure variations that can cause similar damage.

Repeated brain trauma among some football players and boxers has been linked to the subsequent appearance of toxic proteins and neurofibrillary tangles in the brain — a disease known as chronic traumatic encephalopathy, or C.T.E. Many athletes who were found after death to have had the disease experienced memory loss, depression and oncoming dementia as early as their 30s, decades before afflictions like Alzheimer’s appear in the general population.

Just as researchers at the Boston University center and elsewhere have linked some athletes’ later-life emotional problems to their on-field brain trauma, the research on military personnel will try to determine whether some soldiers with post-traumatic stress disorder — a psychological diagnosis — actually retain physical brain damage caused by battlefield blasts. Some signs of P.T.S.D., particularly depression, erratic behavior and the inability to concentrate, appear similar to those experienced by concussed athletes.

Such a link could have effects beyond medicine. Disability benefits for veterans can vary depending on whether an injury is considered psychological or physical. And veterans with P.T.S.D. alone do not receive the Purple Heart, the medal given to soldiers wounded or killed in enemy action, because it is not a physical wound.

Dr. Stern, at Boston University, said that blast injuries could be seen as this generation’s version of exposure to Agent Orange, the herbicide used in the Vietnam War.

“During exposure to Agent Orange, it wasn’t known what long-term effects there would be, but through scientific study, long-term study of veterans, those effects have been more clearly understood,” he said. “We need to know if these individuals with blast injuries are going to require long-term care and treatment.”

The Boston University center and the Sports Legacy Institute will compare findings from the brains of military personnel with those from their athlete program, which has signed up more than 120 donors in less than a year, and other brain banks around the world. The two centers, not the military, are paying for the registry, storage and examination of brain tissue.

But Col. Michael S. Jaffee, national director of the Defense and Veterans Brain Injury Center, said the Defense Department supported the spirit of the research and could assist in approaching active and retired soldiers to register for brain donation.



“Having a brain bank to allow us to study what these brains look like will help us correlate this with other emerging research findings,” said Colonel Jaffee, who is a physician.

But he cautioned: “Whenever we’re talking about organ donation for the sake of science, we’re dealing with a lot of sensitive and cultural issues. We ask people to consider and realize that asking family and individuals to remove the brain from the body, many cultures and traditions may not find that acceptable. So it’s always a challenge to balance the benefits, which are real and will come, with a way to maintain the dignity and respect of people who have made the ultimate sacrifice.”

Benefits of the research on military personnel could extend to the general population, said Dr. Daniel P. Perl, director of neuropathology at the Mount Sinai School of Medicine in New York. Even though civilians are rarely subjected to anything close to the devastating waves that burst from battle explosions, the characteristics of blast injuries could lend insight into brain damage caused by single impacts in automobile accidents, for example.

If protein deposits and tangles appear in the hippocampus area of the brain, for instance, then they would affect short-term memory; appearance in the frontal lobes could impair executive function, and in the cerebellum coordination and balance. The researchers will also be looking at possible genetic factors.

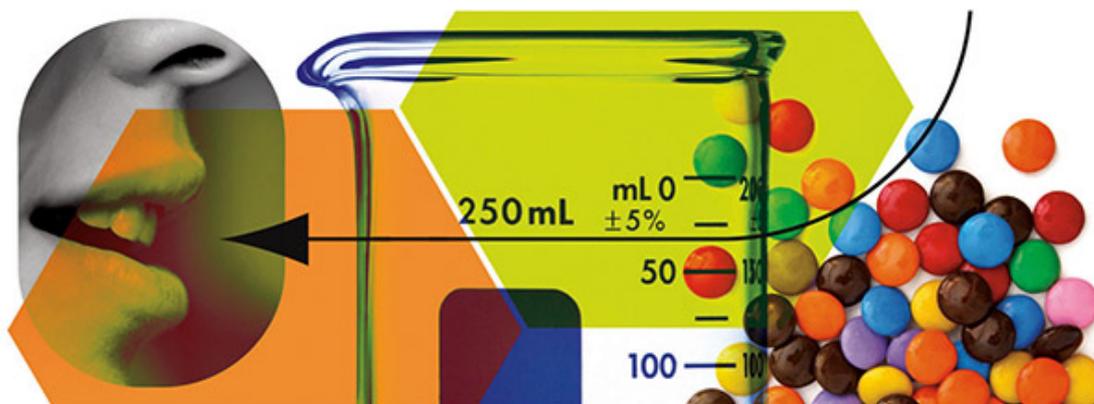
“I wouldn’t be surprised if there was a great deal of overlap between examples of this from the sports arena and the military, but we don’t know,” Dr. Perl said. “The forces are different and presumably the mechanisms are somewhat different. If this research and the examinations are done right, they have the potential to contribute significantly. It could tell us what happens, which we’re not going to get otherwise.”

<http://www.nytimes.com/2009/06/23/health/23brai.html?nl=health&emc=a1>



How the Food Makers Captured Our Brains

By TARA PARKER-POPE



As head of the Food and Drug Administration, Dr. David A. Kessler served two presidents and battled Congress and Big Tobacco. But the Harvard-educated pediatrician discovered he was helpless against the forces of a chocolate chip cookie.

In an experiment of one, Dr. Kessler tested his willpower by buying two gooey chocolate chip cookies that he didn't plan to eat. At home, he found himself staring at the cookies, and even distracted by memories of the chocolate chunks and doughy peaks as he left the room. He left the house, and the cookies remained uneaten. Feeling triumphant, he stopped for coffee, saw cookies on the counter and gobbled one down.

"Why does that chocolate chip cookie have such power over me?" Dr. Kessler asked in an interview. "Is it the cookie, the representation of the cookie in my brain? I spent seven years trying to figure out the answer."

The result of Dr. Kessler's quest is a fascinating new book, "The End of Overeating: Taking Control of the Insatiable American Appetite" (Rodale).

During his time at the Food and Drug Administration, Dr. Kessler maintained a high profile, streamlining the agency, pushing for faster approval of drugs and overseeing the creation of the standardized nutrition label on food packaging. But Dr. Kessler is perhaps best known for his efforts to investigate and regulate the tobacco industry, and his accusation that cigarette makers intentionally manipulated nicotine content to make their products more addictive.

In "The End of Overeating," Dr. Kessler finds some similarities in the food industry, which has combined and created foods in a way that taps into our brain circuitry and stimulates our desire for more.

When it comes to stimulating our brains, Dr. Kessler noted, individual ingredients aren't particularly potent. But by combining fats, sugar and salt in innumerable ways, food makers have essentially tapped into the brain's reward system, creating a feedback loop that stimulates our desire to eat and leaves us wanting more and more even when we're full.

Dr. Kessler isn't convinced that food makers fully understand the neuroscience of the forces they have unleashed, but food companies certainly understand human behavior, taste preferences and desire. In fact, he offers descriptions of how restaurants and food makers manipulate ingredients to reach the aptly named "bliss point." Foods that contain too little or too much sugar, fat or salt are either bland or

overwhelming. But food scientists work hard to reach the precise point at which we derive the greatest pleasure from fat, sugar and salt.

The result is that chain restaurants like Chili's cook up "hyper-palatable food that requires little chewing and goes down easily," he notes. And Dr. Kessler reports that the Snickers bar, for instance, is "extraordinarily well engineered." As we chew it, the sugar dissolves, the fat melts and the caramel traps the peanuts so the entire combination of flavors is blissfully experienced in the mouth at the same time.

Foods rich in sugar and fat are relatively recent arrivals on the food landscape, Dr. Kessler noted. But today, foods are more than just a combination of ingredients. They are highly complex creations, loaded up with layer upon layer of stimulating tastes that result in a multisensory experience for the brain. Food companies "design food for irresistibility," Dr. Kessler noted. "It's been part of their business plans."

But this book is less an exposé about the food industry and more an exploration of us. "My real goal is, How do you explain to people what's going on with them?" Dr. Kessler said. "Nobody has ever explained to people how their brains have been captured."

The book, a New York Times best seller, includes Dr. Kessler's own candid admission that he struggles with overeating.

"I wouldn't have been as interested in the question of why we can't resist food if I didn't have it myself," he said. "I gained and lost my body weight several times over. I have suits in every size."

This is not a diet book, but Dr. Kessler devotes a sizable section to "food rehab," offering practical advice for using the science of overeating to our advantage, so that we begin to think differently about food and take back control of our eating habits.

One of his main messages is that overeating is not due to an absence of willpower, but a biological challenge made more difficult by the overstimulating food environment that surrounds us. "Conditioned hypereating" is a chronic problem that is made worse by dieting and needs to be managed rather than cured, he said. And while lapses are inevitable, Dr. Kessler outlines several strategies that address the behavioral, cognitive and nutritional factors that fuel overeating.

Planned and structured eating and understanding your personal food triggers are essential. In addition, educating yourself about food can help alter your perceptions about what types of food are desirable. Just as many of us now find cigarettes repulsive, Dr. Kessler argues that we can also undergo similar "perceptual shifts" about large portion sizes and processed foods. For instance, he notes that when people who once loved to eat steak become vegetarians, they typically begin to view animal protein as disgusting.

The advice is certainly not a quick fix or a guarantee, but Dr. Kessler said that educating himself in the course of writing the book had helped him gain control over his eating.

"For the first time in my life, I can keep my weight relatively stable," he said. "Now, if you stress me and fatigue me and put me in an airport and the plane is seven hours late — I'm still going to grab those chocolate-covered pretzels. The old circuitry will still show its head."

http://www.nytimes.com/2009/06/23/health/23well.html?_r=1&nl=health&emc=a1

Caucasians Are At Higher Risk Of Developing Ewing's Sarcoma Than Other Races

ScienceDaily (June 23, 2009) — The largest analysis of its kind has found that Caucasians are much more likely than people in other racial/ethnic groups to develop a rare bone and soft tissue cancer called Ewing's sarcoma. In addition, among Caucasians with this cancer, men are more likely to die than women.

Published in the August 1, 2009 issue of *Cancer*, the study indicates that examining the gender and racial differences related to Ewing's sarcoma could provide a better understanding of the disease and could lead to improved treatments for patients.

Ewing's sarcoma has historically been a difficult cancer to treat, but evolving strategies with various chemotherapy drugs, surgery, and radiation have improved survival. Limited studies have identified risk factors for the disease, although it is clear that there are racial differences in incidence. Patients of various races also differ in how they are affected by the disease and how they respond to treatment. However, no reports from population-based cancer registries have verified these observations and no studies have addressed the potential impact of race on patients' health after they are diagnosed.

To get a better sense of racial differences in a large population of patients with Ewing's sarcoma, researchers led by Dr. Sean Scully of the University of Miami analyzed patient information from the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) Program, the largest source for cancer statistics in the United States. They identified individuals diagnosed with Ewing's sarcoma from 1973 to 2005 and analyzed various patient- and cancer-related characteristics.

The investigators found that Caucasians had the highest incidence of Ewing's sarcoma (155 cases per 100,000), followed by Asians/Pacific Islanders (82 cases per 100,000) and African Americans (17 cases per 100,000). Those rates indicate that Caucasians are nine times as likely to be diagnosed with the disease than African -Americans. In addition, the incidence of Ewing's sarcoma has increased significantly over the past three decades in Caucasians. While the analysis identified large differences in incidence rates among races, survival rates were similar. Finally, among Caucasians-but not among other races-women had a much higher likelihood of survival than their male counterparts.

The reasons for these racial and gender differences are not clear. However, "the current study constitutes a significant step towards identification of independent demographic and clinical factors associated with improved survival and clarifies some of the associated controversies in incidence patterns that could impact on the treatment of Ewing's sarcoma," the authors wrote. Additional studies are needed to uncover the causes for racial disparities in incidence and for gender differences in survival.

Adapted from materials provided by Wiley - Blackwell, via AlphaGalileo.

<http://www.sciencedaily.com/releases/2009/06/090622064820.htm>

New Strategies To Prevent Childhood Obesity

ScienceDaily (June 23, 2009) — Researchers from the Keck School of Medicine of the University of Southern California (USC) recently present new findings and strategies for combating childhood obesity at the 5th Biennial Childhood Obesity Conference, held June 9-12 in Los Angeles.

The researchers reported on using wireless body networks and interactive multimedia to promote physical activity in children, and the link between childhood obesity and type 2 diabetes.

Using technology to monitor and prevent obesity

Donna Spruijt-Metz, Ph.D., associate professor, Department of Preventive Medicine at the Keck School of Medicine, presented an overview of the KNOWME NETWORKS study—a program to develop a Mobile Body Area Network that monitors obesity indicators in minority youth.

The network, developed in conjunction with the USC Viterbi School of Engineering, will use a set of wearable wireless sensors that measure physical activity, stress, location in time and space, body fat and a number of other factors. Data will be immediately transmitted to a secure server for storage and analyses. The KNOWME device will be calibrated for the specific user, and researchers will be able to "ping" a participant who remains sedentary for too long, Spruijt-Metz says.

Her presentation includes findings of a study led by colleague Michael I. Goran, Ph.D., professor of preventive medicine, physiology and biophysics and pediatrics, and director of the USC Childhood Obesity Research Center at the Keck School of Medicine. The study looks at the impact of a computer-based education program on promoting physical activity in fourth-grade students.

Two Los Angeles County schools used interactive CD-ROMS for an eight-week long health curriculum, while two control schools received educational CD-ROMS not related to health. Researchers found that the program had a significant impact on obesity reduction in girls, but not in boys.

The results reflect the fact that girls and boys have very different activity levels and attitudes about activity, and that interventions will need to be tailored more specifically, Spruijt-Metz says. However, she believes the study also indicates that technology is an important tool in preventing obesity in youth.

"Technology gives us more objective and reliable measures than self-reporting," she says. "It is particularly appealing because it offers immediate feedback and will allow interventionists and health professionals to respond directly to the child's behavior as part of the intervention." The oral presentation took place June 10 (Session: Can Interactive Media Games Really Increase Physical Activity and Reduce Overweight and Obesity in Children?)

Type 2 diabetes

Francine Kaufman, M.D., professor of pediatrics at the Keck School of Medicine, head of the division of endocrinology and metabolism at Childrens Hospital Los Angeles and author of the popular book "Diabesity," also participated in a discussion that will address prevention as well as treatment of type 2 diabetes, high blood pressure and lipid disorders in children and teens who are overweight or obese.

Adapted from materials provided by [University of Southern California](http://www.usc.edu), via [EurekAlert!](http://www.eurekalert.com), a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090610091347.htm>

Social Competition May Be Reason For Bigger Brain



Professor David Geary finds that competitive ancestors may be blamed for today's big brain. (Credit: Image courtesy of University of Missouri-Columbia)

ScienceDaily (June 23, 2009) — For the past 2 million years, the size of the human brain has tripled, growing much faster than other mammals. Examining the reasons for human brain expansion, University of Missouri researchers studied three common hypotheses for brain growth: climate change, ecological demands and social competition. The team found that social competition is the major cause of increased cranial capacity.

To test the three hypotheses, MU researchers collected data from 153 hominid (humans and our ancestors) skulls from the past 2 million years. Examining the locations and global climate changes at the time the fossil was dated, the number of parasites in the region and estimated population density in the areas where the skulls were found, the researchers discovered that population density had the biggest effect on skull size and thus cranial capacity. "Our findings suggest brain size increases the most in areas with larger populations and this almost certainly increased the intensity of social competition," said David Geary, Curator's Professor and Thomas Jefferson Professor of Psychosocial Sciences in the MU College of Arts and Science. "When humans had to compete for necessities and social status, which allowed better access to these necessities, bigger brains provided an advantage."

The researchers also found some credibility to the climate-change hypothesis, which assumes that global climate change and migrations away from the equator resulted in humans becoming better at coping with climate change. But the importance of coping with climate was much smaller than the importance of coping with other people.

"Brains are metabolically expensive, meaning they take lots of time and energy to develop and maintain, making it so important to understand why our brains continued to evolve faster than other animals," said Drew Bailey, MU graduate student and co-author of the study. "Our research tells us that competition, whether healthy or not, sets the stage for brain evolution."

Journal reference:

1. David Geary and Drew Bailey. **Hominid Brain Evolution**. *Human Nature*, (in press)

Adapted from materials provided by [University of Missouri-Columbia](http://www.unimozz.edu).

<http://www.sciencedaily.com/releases/2009/06/090622152041.htm>

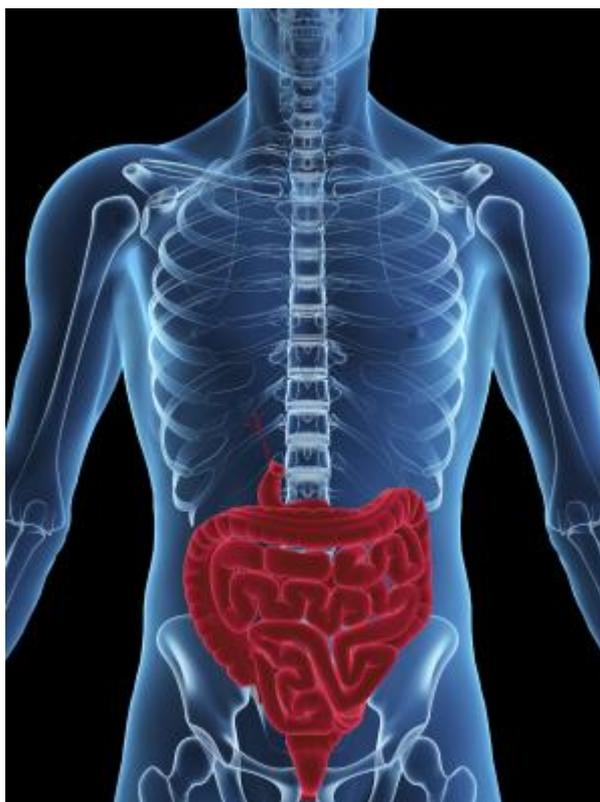
Advance In Bowel Cancer Test Research

The human digestive system. (Credit: CSIRO)

ScienceDaily (June 23, 2009) — Australian researchers have developed gene expression biomarkers which can accurately discriminate pre-cancerous and cancerous colorectal growths from non-cancerous controls.

Being presented June 9 at the Digestive Disease Week conference in Chicago, the preliminary findings are the result of a collaborative study – involving CSIRO, Flinders University and Australian healthcare company, Clinical Genomics Pty Ltd – designed to develop an improved screening/diagnostic test for detecting bowel cancer and significant pre-cancer lesions.

“If we can develop a screening test that can point to the presence of clinically important pre-cancerous adenomas which are then removed during follow-up colonoscopy, we will actually be able to prevent the occurrence of bowel cancer in some cases,” Professor Young says.



“If we can now show that the levels of these biomarkers in blood or stool also correlate strongly with disease state in a large group of patients with cancer or pre-cancer lesions (ie adenomatous polyps) we may have the basis for a very important new diagnostic weapon in the fight against bowel cancer,” says CSIRO’s Preventative Health National Research Flagship Theme Leader in Colorectal Cancer and Gut Health, Dr Trevor Lockett.

According to Professor Graeme Young from Flinders University’s Centre for Cancer Prevention and Control, regular screening for bowel cancer in people aged 50 years and over is a powerful tool for reducing the impact of the disease in Australia.

“If we can develop a screening test that can point to the presence of clinically important pre-cancerous adenomas which are then removed during follow-up colonoscopy, we will actually be able to prevent the occurrence of bowel cancer in some cases,” Professor Young says.

The CEO of Clinical Genomics Pty Ltd, Lawrence La Pointe, says if a more robust screening test for bowel cancer and especially pre-cancer lesions emerges, the research team will have achieved a major advance likely to further improve screening outcomes and more precisely identify those people most likely to benefit from colonoscopic investigation.

Adapted from materials provided by [CSIRO Australia](http://www.csiro.au).

<http://www.sciencedaily.com/releases/2009/06/090609103526.htm>

Citizens In 34 Countries Show Implicit Bias Linking Males More Than Females With Science

ScienceDaily (June 23, 2009) — Implicit stereotypes – thoughts that people may be unwilling to express or may not even know that they have – may have a powerful effect on gender equity in science and mathematics engagement and performance, according to a new study published the week of June 22 in the *Proceedings of the National Academy of Sciences*.

The international study involving more than half a million participants in 34 countries revealed that 70 percent harbor implicit stereotypes associating science with males more than with females. Moreover, in countries whose citizens stereotyped most strongly, boys achieved at a higher level in eighth-grade science and math.

Implicit stereotypes may contribute to continuing underachievement and under-participation among girls and women in science compared to their male peers.

"We found a general tendency, across every country that we investigated, that people on average have an easier time associating science concepts with male, rather than with female," said lead investigator Brian Nosek, an associate professor of psychology at the University of Virginia.

"We correlated our data with a measure of actual science achievement among eighth-graders in those 34 countries and found that in the countries with the largest sex gap – where the boys were performing much better than girls in math and science – there also was the strongest implicit stereotyping of science as a male endeavor."

The science and math achievement scores across nations came from the [Trends in International Mathematics and Science Study](#) and were compared with the implicit stereotype data collected through [Project Implicit](#) led by the study's authors.

Surprisingly, there was no gender gap in the tendency to implicitly stereotype science as male. Male and female study participants showed equally strong associations of science with males.

Among nations represented in the study, the United States falls roughly in the middle of the pack in stereotyping science as male, and in the actual achievement of boys compared to girls at the eighth-grade level.

The study is part of Project Implicit, a publicly accessible research and education Web site at which visitors can complete the Implicit Association Test to measure their own implicit associations. The test is available for a variety of topics involving gender, race, religion and politics.

Participants in the gender and science study were asked to quickly categorize words representing male, such as "he," "son" and "father"; or female, such as "she," "daughter" and "mother," with science; such as "physics," "biology" and "chemistry"; or liberal arts, such as "arts," "history" or "literature." Most participants were able to more quickly categorize male words with science items than female words with the same science words.

In Project Implicit's more than 10 years of existence, more than 10 million tests at the Web site have been completed by visitors around the world. A dozen years of research and hundreds of published studies suggest that people have implicit belief systems that may differ from their declared beliefs.

These implicit beliefs are related to behavior, such as interracial behavior, voting and even drug use. A recent meta-analysis led by Anthony Greenwald, one of the researchers on the current study, provides evidence of the relationship between the Implicit Association Test and a variety of behaviors from more than 100 studies.



"Participants are often surprised to learn that they may have unconscious biases involving gender or race or religion that are quite different from their stated beliefs," said Fred Smyth, a co-investigator on the study and research assistant professor at the University of Virginia.

This divergence between implicit and explicit beliefs, and the relation of both to behavior, suggests that behavior is influenced both by deliberate, explicit beliefs and by automatic, implicit reactions.

"We believe that implicit stereotypes and sex gaps in science achievement are mutually reinforcing mechanisms," Nosek said. "When people see patterns, such as men more often working in scientific fields and women more often in non-scientific fields, then a bias may develop in their minds that men may be better equipped to succeed in those fields, and women less so. Simultaneously, possessing a gender stereotype about science might affect one's own behavior toward others or considerations of one's own potential or career options."

"Culture is a powerful force for shaping the beliefs and behavior of its members," Nosek said. "Even if one's explicit beliefs change, the cultural residue may persist in memory and continue to influence behavior."

This presents a challenge for addressing gender gaps in scientific engagement.

Nosek noted that even as women and girls achieve more success in the sciences, and enter these fields in ever greater numbers, underlying stereotypes that more often link men with science may persist.

"If countries want to increase their competitiveness in science and engineering, they might want to look at their social environments, the social factors like implicit stereotypes that exist at a cultural level, and how this might inhibit women – who comprise more than half their intellectual pool – from contributing to scientific and engineering advancement," Nosek said.

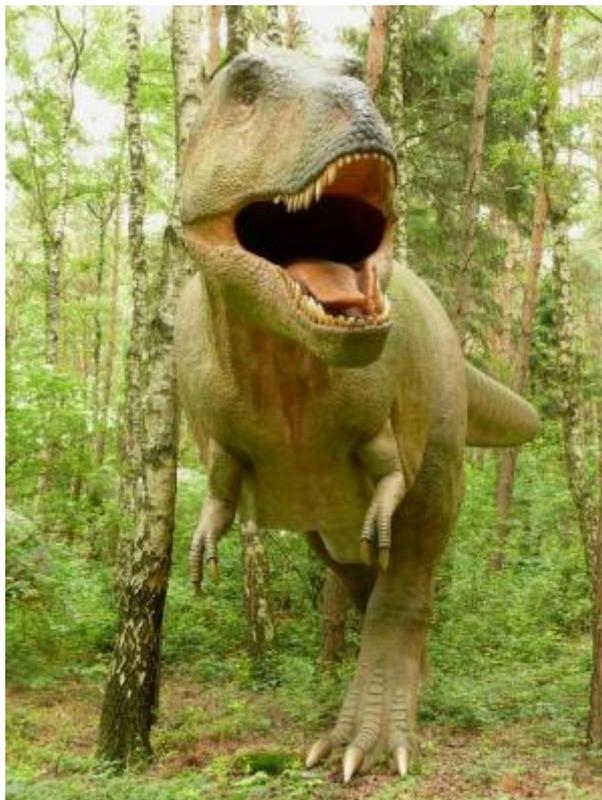
Over the past decade, Nosek, Mahzarin Banaji of Harvard University, and test creator Anthony Greenwald of the University of Washington have led the development of the Implicit Association Test to assess mental associations that may be different than what people know or say about themselves. For the gender and science study, they worked with colleagues at universities and institutes across the globe.

Adapted from materials provided by University of Virginia, via EurekAlert!, a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090622171410.htm>



Dinosaurs May Have Been Smaller Than Previously Thought



Model dinosaur. Scientists have discovered that the original statistical model used to calculate dinosaur mass is flawed, suggesting dinosaurs have been oversized. (Credit: iStockphoto/Klaus Nilkens)

ScienceDaily (June 22, 2009) — The largest animals ever to have walked the face of the earth may not have been as big as previously thought, reveals a paper published June 21 in the Zoological Society of London's *Journal of Zoology*. Scientists have discovered that the original statistical model used to calculate dinosaur mass is flawed, suggesting dinosaurs have been oversized. Widely cited estimates for the mass of *Apatosaurus louisae*, one of the largest of the dinosaurs, may be double that of its actual mass (38 tonnes vs. 18 tonnes).

"Paleontologists have for 25 years used a published statistical model to estimate body weight of giant dinosaurs and other extraordinarily large animals in extinct lineages. By re-examining data in the original reference sample, we show that the statistical model is seriously flawed and that the giant dinosaurs probably were only about half as heavy as is generally believed" says Gary Packard from Colorado State University. The new predictions have implications for numerous theories about the biology of dinosaurs, ranging from their energy metabolism to their food requirements and to their modes of locomotion.

Journal reference:

1. . **Allometric equations for predicting body mass of dinosaurs.** *Journal of Zoology*, June 21, 2009 DOI: [10.1111/j.1469-7998.2009.00594.x](https://doi.org/10.1111/j.1469-7998.2009.00594.x)

Adapted from materials provided by Wiley - Blackwell, via AlphaGalileo.

<http://www.sciencedaily.com/releases/2009/06/090621195620.htm>

Human Eye Inspires Advance In Computer Vision



Inspired by the behavior of the human eye, Boston College computer scientists have developed a technique that lets computers see objects as fleeting as a butterfly or tropical fish with nearly double the accuracy and 10 times the speed of earlier methods. (Credit: Hao Jiang, Boston College)

ScienceDaily (June 22, 2009) — Inspired by the behavior of the human eye, Boston College computer scientists have developed a technique that lets computers see objects as fleeting as a butterfly or tropical fish with nearly double the accuracy and 10 times the speed of earlier methods.

The linear solution to one of the most vexing challenges to advancing computer vision has direct applications in the fields of action and object recognition, surveillance, wide-base stereo microscopy and three-dimensional shape reconstruction, according to the researchers, who will report on their advance at the upcoming annual IEEE meeting on computer vision.

BC computer scientists Hao Jiang and Stella X. Yu developed a novel solution of linear algorithms to streamline the computer's work. Previously, computer visualization relied on software that captured the live image then hunted through millions of possible object configurations to find a match. Further compounding the challenge, even more images needed to be searched as objects moved, altering scale and orientation.

Rather than combing through the image bank – a time- and memory-consuming computing task – Jiang and Yu turned to the mechanics of the human eye to give computers better vision.

"When the human eye searches for an object it looks globally for the rough location, size and orientation of the object. Then it zeros in on the details," said Jiang, an assistant professor of computer science. "Our method behaves in a similar fashion, using a linear approximation to explore the search space globally and quickly; then it works to identify the moving object by frequently updating trust search regions."

Trust search regions act as visual touchstones the computer returns to again and again. Jiang and Yu's solution focuses on the mathematically-generated template of an image, which looks like a constellation when lines are drawn to connect the stars. Using the researchers' new algorithms, computer software



identifies an object using the template of a trust search region. The program then adjusts the trust search regions as the object moves and finds its mathematical matches, relaying that shifting image to a memory bank or a computer screen to record or display the object.

Jiang says using linear approximation in a sequence of trust regions enables the new program to maintain spatial consistency as an object moves and reduces the number of variables that need to be optimized from several million to just a few hundred. That increased the speed of image matching 10 times over compared with previous methods, he said.

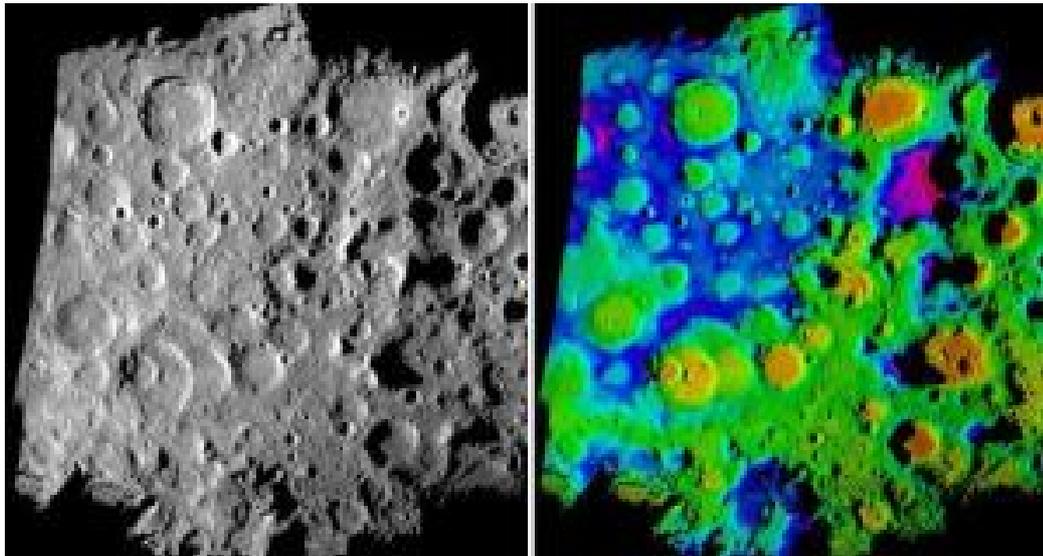
The researchers tested the software on a variety of images and videos – from a butterfly to a stuffed Teddy Bear – and report achieving a 95 percent detection rate at a fraction of the complexity. Previous so-called "greedy" methods of search and match achieved a detection rate of approximately 50 percent, Jiang said.

Jiang will present the team's findings at the IEEE Conference on Computer Vision and Pattern Recognition 2009, which takes place June 20-25 in Miami.

Adapted from materials provided by Boston College, via EurekAlert!, a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090618084258.htm>

Scientists Bring 'Light' To Moon's Permanently Dark Craters



This composite image depicts the moon's rugged south polar region in two lights. The black and white image on the left is a computer generated view of the pole from radar reflectance data. The color image on the right is a topographic map of that same area. The color image on the right is the highest resolution topography map to date of the moon's south pole. (Credit: NASA/JPL)

ScienceDaily (June 22, 2009) — A new lunar topography map with the highest resolution of the moon's rugged south polar region provides new information on some of our natural satellite's darkest inhabitants - permanently shadowed craters. The map was created by scientists at NASA's Jet Propulsion Laboratory, Pasadena, Calif., who collected the data using the Deep Space Network's Goldstone Solar System Radar located in California's Mojave Desert. The map will help Lunar Crater Observation and Sensing Satellite (LCROSS) mission planners as they target for an encounter with a permanently dark crater near the lunar South Pole. "Since the beginning of time, these lunar craters have been invisible to humanity," said Barbara Wilson, a scientist at NASA's Jet Propulsion Laboratory in Pasadena, Calif., and manager of the study. "Now we can see detailed topography inside these craters down to 40 meters [132 feet] per pixel, with height accuracy of better than 5 meters [16 feet]." The terrain map of the moon's south pole is online at: <http://www.nasa.gov/topics/moonmars/features/moon-20090618.html>. Scientists targeted the moon's south polar region using Goldstone's 70-meter (230-foot) radar dish. The antenna, three-quarters the size of a football field, sent a 500-kilowatt-strong, 90-minute-long radar stream 373,046 kilometers (231,800 miles) to the moon. Signals were reflected back from the rough-hewn lunar terrain and detected by two of Goldstone's 34-meter (112-foot) antennas on Earth. The roundtrip time, from the antenna to the moon and back, was about two-and-a-half seconds. The scientists compared their data with laser altimeter data recently released by the Japanese Aerospace Exploration Agency's Kaguya mission to position and orient the radar images and maps. The new map provides contiguous topographic detail over a region approximately 500 kilometers (311 miles) by 400 kilometers (249 miles). Funding for the program was provided by NASA's Exploration Systems Mission Directorate. JPL manages the Goldstone Solar System Radar and the Deep Space Network for NASA. JPL is managed for NASA by the California Institute of Technology in Pasadena. More information about the Goldstone Solar System Radar and Deep Space Network is at <http://deepspace.jpl.nasa.gov/dsn>. More information about NASA's exploration program to return humans to the moon is at <http://www.nasa.gov/exploration>.

Adapted from materials provided by [NASA/Jet Propulsion Laboratory](http://www.nasa.gov).

<http://www.sciencedaily.com/releases/2009/06/090621215329.htm>

PET Scans May Improve Accuracy Of Dementia Diagnosis

ScienceDaily (June 22, 2009) — A new study shows that the use of positron emission tomography (PET) scans may improve the accuracy of dementia diagnoses early in disease onset for more than one out of four patients. The results were presented at SNM's 56th Annual Meeting.

Early, accurate diagnosis of dementia is critical for providing the best available courses of treatment and therapies in the beginning stages of disease, when treatments can be most effective. PET scans enable physicians to identify the neurological conditions underlying each patient's mental decline and choose appropriate courses of treatment.

"Routine clinical assessments do not accurately identify the root causes of dementia in the early stages," said Kirk A. Frey, a physician with the University of Michigan Hospitals' Division of Nuclear Medicine and lead author of the study. "Our preliminary results clearly indicate that molecular imaging technologies, such as PET scans, can help diagnose a patient's specific type of dementia. This is critical for providing the best possible care. Additionally, PET's ability to pinpoint neurological underpinnings of different forms of dementia could lead to new, more targeted drugs and therapies."

More than 5 million people each year are newly diagnosed with dementia, a disease that takes many forms and includes memory loss or other mental impairments that interfere with daily life. The most common type of dementia is Alzheimer's disease. Other types include frontotemporal dementia, which affects the frontal and temporal lobes of the brain, and Lewy body dementia, which involves degeneration of dopamine nerves in addition to the temporal and parietal lobes. Although these types of dementia have different causes, patients can express similar symptoms in the early stages, making accurate diagnosis difficult. Providing appropriate treatments and therapies as early as possible can avoid unnecessary, and sometimes severe, side-effects and complications.

The new study identified 66 patients with mild dementia or mild cognitive impairment who were evaluated through standard neurological testing and anatomic brain imaging. Three clinical experts reviewed the results of these data to make diagnoses of either Alzheimer's disease, frontotemporal dementia or dementia with Lewy bodies. Patients then underwent PET scans for amyloid deposits and for dopamine nerve integrity. Patients' initial diagnoses changed more than 25 percent of the time after PET imaging. PET scans provided images of important signals for disease that other examinations missed, such as deposits of amyloid plaque, which are a common indicator of Alzheimer's disease, and damage to dopamine nerves in Lewy body dementia.

The study will track patients for two years to confirm the accuracy of their diagnoses.

Adapted from materials provided by [Society of Nuclear Medicine](#).

<http://www.sciencedaily.com/releases/2009/06/090615144333.htm>

Ice Sheets Can Retreat 'In A Geologic Instant,' Study Of Prehistoric Glacier Shows



Jason Briner's research reveals that modern glaciers in deep ocean water can undergo periods of rapid retreat, where they can shrink even more quickly than has recently been observed. (Credit: Image courtesy of University at Buffalo)

ScienceDaily (June 22, 2009) — Modern glaciers, such as those making up the Greenland and Antarctic ice sheets, are capable of undergoing periods of rapid shrinkage or retreat, according to new findings by paleoclimatologists at the University at Buffalo.

The paper, published on June 21 in *Nature Geoscience*, describes fieldwork demonstrating that a prehistoric glacier in the Canadian Arctic rapidly retreated in just a few hundred years.

The proof of such rapid retreat of ice sheets provides one of the few explicit confirmations that this phenomenon occurs.

Should the same conditions recur today, which the UB scientists say is very possible, they would result in sharply rising global sea levels, which would threaten coastal populations.

"A lot of glaciers in Antarctica and Greenland are characteristic of the one we studied in the Canadian Arctic," said Jason Briner, Ph.D., assistant professor of geology in the UB College of Arts and Sciences and lead author on the paper. "Based on our findings, they, too, could retreat in a geologic instant."

The new findings will allow scientists to more accurately predict how global warming will affect ice sheets and the potential for rising sea levels in the future, by developing more robust climate and ice sheet models.

Briner said the findings are especially relevant to the Jakobshavn Isbrae, Greenland's largest and fastest moving tidewater glacier, which is retreating under conditions similar to those he studied in the Canadian Arctic.

Acting like glacial conveyor belts, tidewater glaciers are the primary mechanism for draining ice sheet interiors by delivering icebergs to the ocean.

"These 'iceberg factories' exhibit rapid fluctuations in speed and position, but predicting how quickly they will retreat as a result of global warming is very challenging," said Briner.

That uncertainty prompted the UB team to study the rates of retreat of a prehistoric tidewater glacier, of similar size and geometry to contemporary ones, as way to get a longer-term view of how fast these glaciers can literally disappear.

The researchers used a special dating tool at UB to study rock samples they extracted from a large fjord that drained the ice sheet that covered the North American Arctic during the past Ice Age.

The samples provided the researchers with climate data over a period from 20,000 years ago to about 5,000 years ago, a period when significant warming occurred.

"Even though the ice sheet retreat was ongoing throughout that whole period, the lion's share of the retreat occurred in a geologic instant -- probably within as little as a few hundred years," said Briner.

The UB research reveals that the period of rapid retreat was triggered once the glacier entered deep ocean waters, nearly a kilometer deep, Briner said.

"The deeper water makes the glacier more buoyant," he explained.

"Because the rates of retreat were so much higher in the deep fjord, versus earlier when it terminated in more shallow waters or on land, the findings suggest that contemporary tidewater glaciers in Greenland and Antarctica that are retreating into deep waters may begin to experience even faster rates of retreat than are currently being observed," said Briner.

Right now, Jakobshavn Isbrae is draining into waters that are nearly a kilometer deep, he said, which means that its current rates of retreat -- as fast as 10 kilometers in the past decade -- could continue for the next hundred years.

"If modern glaciers do this for several decades, this would rapidly raise global sea level, intercepting coastal populations and requiring vast re-engineering of levees and other mitigation systems," said Briner.

Co-authors on the paper were Aaron C. Bini, formerly a master's of science candidate in the UB Department of Geology, and Robert S. Anderson, Ph.D., in the Department of Geological Sciences at the University of Colorado, Boulder.

Briner's research was funded by the National Science Foundation.

Adapted from materials provided by [University at Buffalo](http://www.scienceatbuffalo.edu).

<http://www.sciencedaily.com/releases/2009/06/090621143315.htm>

Biofuel Could Lighten Jet Fuel's Carbon Footprint Over 80 Percent



Camelina sativa. (Credit: Image courtesy of Michigan Technological University)

ScienceDaily (June 22, 2009) — The seeds of a lowly weed could cut jet fuel's cradle-to-grave carbon emissions by 84 percent.

David Shonnard, Robbins Chair Professor of Chemical Engineering, analyzed the carbon dioxide emissions of jet fuel made from camelina oil over the course of its life cycle, from planting to tailpipe. "Camelina jet fuel exhibits one of the largest greenhouse gas emission reductions of any agricultural feedstock-derived biofuel I've ever seen," he said. "This is the result of the unique attributes of the crop-- its low fertilizer requirements, high oil yield, and the availability of its coproducts, such as meal and biomass, for other uses."

Camelina sativa originated in Europe and is a member of the mustard family, along with broccoli, cabbage and canola. Sometimes called false flax or gold-of-pleasure, it thrives in the semi-arid conditions of the Northern Plains; the camelina used in the study was grown in Montana.

Oil from camelina can be converted to a hydrocarbon green jet fuel that meets or exceeds all petroleum jet fuel specifications. The fuel is a "drop-in" replacement that is compatible with the existing fuel infrastructure, from storage and transportation to aircraft fleet technology. "It is almost an exact replacement for fossil fuel," Shonnard explained. "Jets can't use oxygenated fuels like ethanol; they have to use hydrocarbon replacements."

Shonnard conducted the life cycle analysis for UOP LLC, of Des Plaines, Ill., a subsidiary of Honeywell and a provider of oil refining technology. In an April 28 release, it cited Boeing executive Billy Glover,



managing director of environmental strategy, who called camelina "one of the most promising sources for renewable fuels that we've seen."

"It performed as well if not better than traditional jet fuel during our test flight with Japan Airlines earlier this year and supports our goal of accelerating the market availability of sustainable, renewable fuel sources that can help aviation reduce emissions," Glover said. "It's clear from the life cycle analysis that camelina is one of the leading near-term options and, even better, it's available today."

Because camelina needs little water or nitrogen to flourish, it can be grown on marginal agricultural lands. "Unlike ethanol made from corn or biodiesel made from soy, it won't compete with food crops," said Shonnard. "And it may be used as a rotation crop for wheat, to increase the health of the soil."

Tom Kalnes is a senior development associate for UOP in its renewable energy and chemicals research group. His team used hydroprocessing, a technology commonly used in the refining of petroleum, to develop a flexible process that converts camelina oil and other biological feedstocks into green jet fuel and renewable diesel fuel.

As to whether we will all be flying in plant-powered aircraft, his answer is, "It depends."

"There are a few critical issues," Kalnes said. "The most critical is the price and availability of commercial-scale quantities of second generation feedstocks." Additionally, more farmers need to be convinced to grow a new crop, and refiners must want to process it.

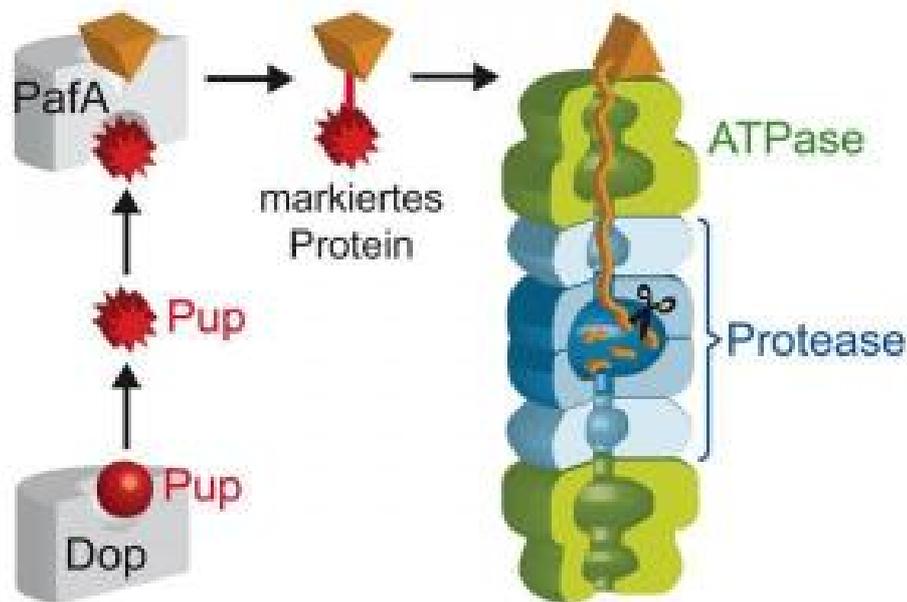
"But if it can create jobs and income opportunities in rural areas, that would be wonderful," he said.

Adapted from materials provided by Michigan Technological University, via Newswise.

<http://www.sciencedaily.com/releases/2009/06/090619202611.htm>



Exploring New Therapy Strategies For Tuberculosis



The figure shows how proteins are prepared for their degradation in a tuberculosis bacterium. (Credit: Wolfgang Kress & Frank Striebel / ETH Zurich)

ScienceDaily (June 22, 2009) — Certain protein degradation complexes, molecular “shredders”, dispose protein garbage. Molecular machines of that kind belong to the area of expertise of Eilika Weber-Ban, who together with her team has now successfully decoded how proteins in tuberculosis bacteria are prepared for disposal.

The fact that bacteria also possess a special “small” protein that can be attached to other proteins to alter their fate became known only recently. The “small” protein, which has been named “Pup”, helps to dispose of other proteins. However, its attachment may also control and regulate other important processes in the cells. “Pup” acts as a kind of marker. By being attached to another protein, it signals to the degradation complex that the marked protein is ready for disposal.

Mode of operation investigated in the test tube

Eilika Weber-Ban, research group leader at the Institute of Molecular Biology & Biophysics of ETH Zurich, and her team have now succeeded in understanding how the “Pup” protein works in the tuberculosis pathogen *Mycobacterium tuberculosis*. In the test tube, the researchers were able to show how Pup is attached to proteins. By doing so, the scientists discovered a new enzyme which they call “Dop”. The results were published recently in *Nature Structural & Molecular Biology*. The study may provide the basis for therapeutic strategies for people suffering from tuberculosis, especially in the case of patients in whom the pathogen has acquired resistance to antibiotics.

Coupling in two steps

The “Pup” degradation signal is coupled to a protein in two steps: first, “Dop” modifies the degradation signal to allow another enzyme to couple the modified “Pup” to its target protein. Now, the “molecular shredders” come into play: due to the attached Pup-signal the protein is ready to enter the “shredders”. These consist of a protein complex, which can be divided into two parts according to their function. Weber-Ban describes the entrance region, where the marked proteins enter through pores into the protease

complex, as the engine. “Its task is to unroll the folded protein, which can be thought of as a ball of yarn, so it can be threaded into the second part of the shredder and chopped into pieces”, Weber-Ban explains. This function is carried out by molecular “scissors” inside the shredder.

In the eighties, scientists discovered a similar marker protein that disposes proteins in cells of multi-cellular organisms such as plants, animals and humans. The scientists were awarded the 2004 Nobel Prize for Chemistry for their discovery. However, until late 2008 it was unknown that proteins of that kind also existed in bacteria. According to the ETH researchers, however, the bacterial and human marker proteins differ markedly in their structure and in the way they function although they both ensure the degradation of proteins in cells.

No side-effects

It is still unclear which molecular processes are affected by “Pup”-mediated degradation in the tuberculosis pathogen. However, it is known that bacteria without this complex degradation mechanism cannot survive in the epithelial cells of the lungs. “This is why both the marker proteins and the degradation complex are suitable targets for therapy strategies”, says Weber-Ban. She points out that the marking system is a particularly good target in this respect, as it differs from that of humans and therefore drugs targeting the bacterial Pup-system should have no side-effects for humans.

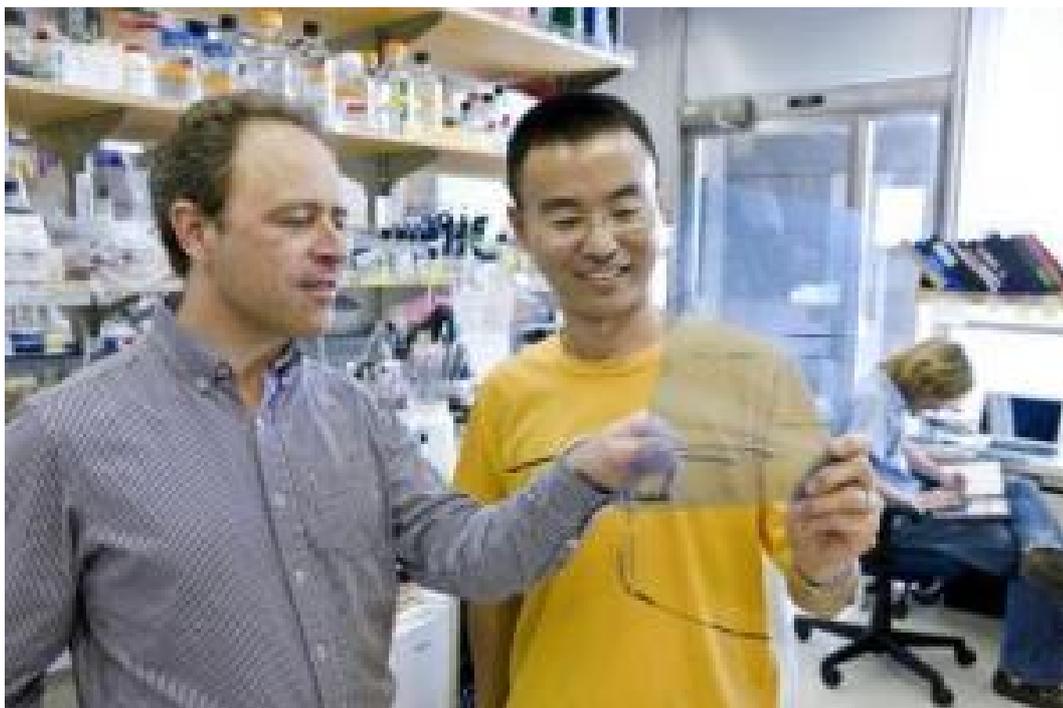
Journal reference:

1. Striebel et al. **Bacterial ubiquitin-like modifier Pup is deamidated and conjugated to substrates by distinct but homologous enzymes.** *Nature Structural & Molecular Biology*, 2009; 16 (6): 647 DOI: [10.1038/nsmb.1597](https://doi.org/10.1038/nsmb.1597)

Adapted from materials provided by [ETH Zurich](http://www.ethz.ch).

<http://www.sciencedaily.com/releases/2009/06/090613105602.htm>

How Obesity Increases The Risk For Diabetes



Marc Montminy (left) and Yiguo Wang are researchers with the Salk Institute for Biological Studies. (Credit: Courtesy of the Salk Institute for Biological Studies)

ScienceDaily (June 22, 2009) — Obesity is probably the most important factor in the development of insulin resistance, but science's understanding of the chain of events is still spotty. Now, researchers at the Salk Institute for Biological Studies have filled in the gap and identified the missing link between the two. Their findings, to be published in the June 21, 2009 advance online edition of the journal *Nature*, explain how obesity sets the stage for diabetes and why thin people can become insulin-resistant.

The Salk team, led by Marc Montminy, Ph.D., a professor in the Clayton Foundation Laboratories for Peptide Biology, discovered how a condition known as ER (endoplasmic reticulum) stress, which is induced by a high fat diet and is overly activated in obese people, triggers aberrant glucose production in the liver, an important step on the path to insulin resistance.

In healthy people, a "fasting switch" only flips on glucose production when blood glucose levels run low during fasting. "The existence of a second cellular signaling cascade—like an alternate route from A to B—that can modulate glucose production, presents the potential to identify new classes of drugs that might help to lower blood sugar by disrupting this alternative pathway," says Montminy.

It had been well established that obesity promotes insulin resistance through the inappropriate inactivation of a process called gluconeogenesis, where the liver creates glucose for fuel and which ordinarily occurs only in times of fasting. Yet, not all obese people become insulin resistant, and insulin resistance occurs in non-obese individuals, leading Montminy and his colleagues to suspect that fasting-induced glucose production was only half the story.

"When a cell starts to sense stress a red light goes on, which slows down the production of proteins," explains Montminy. "This process, which is known as ER stress response, is abnormally active in livers of obese individuals, where it contributes to the development of hyperglycemia, or high blood glucose levels. We asked whether chronic ER stress in obesity leads to abnormal activation of the fasting switch

that normally controls glucose production in the liver." The ER, short for endoplasmic reticulum, is a protein factory within the cell.

To test this hypothesis the Salk team asked whether ER stress can induce gluconeogenesis in lean mice. Glucose production is turned on by a transcriptional switch called CRTC2, which normally sits outside the nucleus waiting for the signal that allows it to slip inside and do its work. Once in the nucleus, it teams up with a protein called CREB and together they switch on the genes necessary to increase glucose output. In insulin-resistant mice, however, the CRTC2 switch seems to get stuck in the "on" position and the cells start churning out glucose like sugar factories in overdrive.

Surprisingly, when postdoctoral researcher and first author Yiguo Wang, Ph.D., mimicked the conditions of ER stress in mice, CRTC2 moved to the nucleus but failed to activate gluconeogenesis. Instead, it switched on genes important for combating stress and returning cells to health. On closer inspection, Wang found that in this scenario CRTC2 did not bind to CREB but instead joined forces with another factor, called ATF6a.

What's more, like jealous lovers CREB and ATF6a competing for CRTC2's affection—the more ATF6a is bound to CRTC2, the less there is for CREB to bind to. "This clever mechanism ensures that a cell in survival mode automatically shuts down glucose production, thus saving energy," says Wang.

This observation led the researcher to ask what happens to ATF6a following the kind of persistent stress presented by obesity? They found that the levels of ATF6a go down when ER stress is chronically activated, compromising the cells' survival pathway and favoring the glucose production pathway; hyperglycemia wins in conditions of persistent stress.

Explains Wang, "Our study helps to explain why obese people have a stronger tendency to become diabetic. When ER stress signaling is abnormal glucose output is actually increased."

"It is possible that mutations in the highly conserved CRTC2 lead to a predisposition to inappropriate gluconeogenesis," says Montminy, who is now trying to identify natural mutations in CRTC2 that may lead to insulin resistance in carriers.

In addition to Drs. Wang and Montminy, researchers contributing to this study include research technician Liliana Vera, and Wolfgang H. Fischer, Ph.D., director of the Mass Spectrometry Core Facility.

The work was supported by grants from the National Institutes of Health, the Clayton Foundation for Medical Research, the Kiekhefer Foundation and the Vincent J. Coates Foundation.

Adapted from materials provided by [Salk Institute](#), via [EurekAlert!](#), a service of AAAS.

<http://www.sciencedaily.com/releases/2009/06/090621143236.htm>

THE WAY WE LIVE NOW

Everyone a Winner? The Lost Art of Conceding Defeat

By MATT BAI



Even before he ran for re-election to the Senate, Norm Coleman saw more than his share of ignominious elections. First he lost the Minnesota governorship to a former pro wrestler who called himself the Body. Then he just barely managed to wrest a Senate seat from an opponent, Paul Wellstone, who had recently perished in a plane crash. So can you really blame Coleman for having spent the last eight months furiously trying not to have to concede defeat to Al Franken — a man who once acted alongside a gorilla on the set of “Trading Places”? And yet all this protesting came at a real cost to the voters, because while Coleman was appealing his case to every Minnesota court that would hear it, his old colleagues back in Washington were actually grappling with some pretty consequential work — doling out a few trillion dollars in stimulus money and bailout funds. And through it all, the great state of Minnesota exercised only half the voice afforded the other 49 states. As they say in high-school locker rooms, Coleman refused to lose — even when it seemed clear that he had lost just the same.

Recounts and postelection wrangling are nothing new in America, of course. Reconstruction ended in the South because of a prolonged presidential standoff in 1876; Republicans ultimately got to keep the presidency, in the person of Rutherford Hayes, while Democrats extracted a promise to withdraw federal troops from the old Confederacy. Lyndon Johnson won his 1948 Senate primary only after the state Democratic committee voted to certify the ballots of dozens of loyal, albeit dead, voters. Such epic elections are often clouded by revelations of fraud, and yet the mundane truth is that American democracy is a little like your bathroom scale. If you want to know if you lost a pound or two, step on the scale and you’ll probably find out; if, on the other hand, you’re looking to find out whether you’ve lost an ounce, then the reading will vary every time you plant your feet. Similarly, no democratic system, with its vulnerability to human error and mischief, can be calibrated to function precisely within a certain margin of error. No matter how many new machines and monitors you deploy in the pursuit of perfection, some elections are always going to end in what is essentially a tie.

What is new are the lengths to which losing candidates will now routinely go — and the money the parties will spend — to avoid their certain fates. It used to be that when a candidate lost by a few suspect votes, the first question that arose was whether he would seek a rematch. Richard Nixon, who felt certain he’d been mugged in several states in 1960, exited quickly to begin plotting his return to office. Now, it seems, the first question anyone asks — at least since the 2000 presidential quagmire — is for how long you intend to fight the results in court. The governor’s race in Washington State in 2004 was disputed for

eight months. More recently, the recount in a special election for Congress in New York dragged on for more than three weeks amid legal arguments over what did and did not constitute a valid ballot. What happens in politics, however, can almost never be extricated from the culture at large, and the lost art of losing nobly is by no means an exclusively political phenomenon. At the upper reaches of society, we litigate ever more readily and accept misfortune with ever less stoicism. Being fired from a job becomes the beginning of a negotiation, while a routine school suspension instantly goes to appeal. In part, this is probably the inevitable reckoning for a culture that gives trophies to every Little Leaguer because, as the saying goes, we're all winners. Shouldering defeat is, after all, a skill that has to be learned early, like speaking Mandarin or sleeping through the night. Then, too, we are guided by an unflagging faith in modern technology — a sense that no discrepancy is small enough to defy absolute quantification. A blown call on a home run hooking foul used to be part of the game, a generations-old lesson in the randomness of adversity. Now the crowd breaks for hot dogs while the instant replay delivers its verdict and the homer is revoked. There are no more bad breaks in life — only bad ump. Perhaps we just fear that if we concede our losses and leave the stage, then the memory of our dignified exit may not last long enough for anyone to want us back. This seems to be the apprehension behind a regrettable TV show like "I'm a Celebrity . . . Get Me Out of Here!" in which people who were once sort of successful cling to their last shred of fame by, for instance, allowing themselves to be submerged in a tank with reptiles — no doubt for the money, but also out of a fear that their moment, once passed, will never return. (This season's guests include Patti Blagojevich, the wife of former Gov. Rod Blagojevich of Illinois, who wanted to go on the show himself, except that the judge handling his criminal case thought it not a terrific idea.) In a world where everyone clicks the "refresh" key every 30 seconds, a noiseless retreat is a risky proposition. The good news is that you won't see Norm Coleman swimming with snakes anytime soon. Now that Minnesota's governor, Tim Pawlenty, has decided against a re-election campaign, it seems quite likely that Coleman will excuse his legal team and turn his attention toward yet another campaign, this time for the office he really wanted to begin with. Which means, if you think about it just the right way, that he isn't really losing at all.

Matt Bai, who covers politics for the magazine, is the author of "The Argument: Inside the Battle to Remake Democratic Politics."

<http://www.nytimes.com/2009/06/21/magazine/21FOB-wwln-t.html?partner=rss&emc=rss>

Jodi Picoult and the Anxious Parent

By GINIA BELLAFANTE



IN THE NOVELS of Jodi Picoult, terrible things happen to children of middle-class parentage: they become terminally ill, or are maimed, gunned down, killed in accidents, molested, abducted, bullied, traumatized, stirred to violence. The assault on any individual family is typically mounted from angles multiple and unforeseen.

In “My Sister’s Keeper,” the first of Picoult’s 16 novels to be made into a feature film (it opens this Friday), a couple with a delinquent teenage son and a daughter who has acute promyelocytic leukemia conceive a third child to serve as her bone-marrow donor. Multiple operations on both girls follow over the span of many years, until the donor child, victim of a sort of abuse that is passing itself off as godliness, rebels at 13, devastating her mother by initiating legal proceedings to ensure her own corporeal autonomy.

Picoult’s storytelling revels in sequential miseries — no singular unhappiness ever seems sufficient. Various nightmares fuel the plot of “Nineteen Minutes,” a post-Columbine novel and one of her most popular books. Here, a midwife and her academic husband are largely blind to the depths of their son’s isolation — until he shoots close to a dozen of his classmates — just as they were blind to the drug problems and viciousness of an older son, who seemed to function so exceptionally. And yet they appear to be such lovely parents, so well-meaning and engaged (they read *The Economist*).

In Picoult’s fiction we rarely encounter characterologically bad parents. Instead, we meet mothers and fathers who try and fail, baroquely, to meet the current standards of caring for children — people who affect the deepest concern, who have absorbed the therapeutic language of talk shows and women’s magazines but who are congenitally unable to implement the idiom. Parental inadequacy and elaborate misfortune repeatedly conspire in her books to produce altogether new horrors; by the end of “My Sister’s Keeper,” the family is left to confront a tragedy unprompted by the central maladies, one meant to serve as a cosmic rebuke to the mother’s stilted management. (And one so insistent in its shock value that it may inspire the reader to deposit the book under the wheels of a minivan.)



Picoult, who is 43, married and the mother of three teenagers, has found enormous commercial success as the most visible and dedicated practitioner of a subcategory of contemporary genre fiction that might best be described as the literature of children in peril. Picoult does not write thrillers per se, but her books contain the careering plots and rapid energy of paperbacks meant to be consumed on flights between J.F.K. and LAX (she is a staple of the airport bookstore). Her formula seems largely her own; she produces novels of legalistic suspense — composed in tidy ironies and florid prose — that, like the midcentury weepies “Stella Dallas” and “Imitation of Life,” have the effect of questioning the redemptive value of motherhood. Really, why would anyone bother?

Picoult’s message is at once cautionary and subverting. As much as her novels underscore the hazards of parental shortcomings, at a certain level they seem to exist to make a mockery of the cherished idea that we ought not to have any. To read them is to feel that hoisting a toddler into one of the Humvee strollers of the current age is like applying an exfoliant to a malignant tumor in the hope that it can be scrubbed away. When I met with Picoult in Boston recently, where she was researching her next book, I remarked what a miracle it is that any child survives to the age of 6, given the exposed outlets, tumbling kitchen knives and thousand quotidian threats that are, in a new parent’s mind, colluding toward an entirely opposite outcome. Picoult laughed in sympathy. “You can’t make your kids wear helmets, you just can’t do that,” she told me. The real dangers are, of course, the ones we can’t (or refuse to) anticipate.

THE ENDANGERED OR ruined child has emerged as a media entity within a culture that has idealized the responsibilities of parenthood to a degree, as has been exhaustively noted, unprecedented in human history. The more we seek to protect our children, the more we fear the consequences of an inability to do so. Increasingly over the past decade, writers of crime fiction — Harlan Coben and Dennis Lehane among many others — have made a recurring subject of children violated by predation, abandonment, neglect. Picoult’s novels, and those with similar themes if perhaps greater literary ambition (*Alice Sebold*’s best-selling “*Lovely Bones*,” about a murdered girl watching over her loved ones from the beyond, comes to mind), exist against a backdrop of television’s grimly obsessive interest in threats to the well-being of the young and vulnerable, the trademark of local news broadcasts and programming like CNN’s “*Nancy Grace*,” which luridly tries to make a national frenzy out of every missing-child case under the guise that it is on a mission to Do Something. The story of *Natalee Holloway*, the Alabama teenager who disappeared during a school trip to Aruba four years ago, famously consumed uncountable hours of cable and network news time before it became the basis of a movie on Lifetime, a two-hour episode of “*Law & Order: Criminal Intent*” and the subject of at least six nonfiction books.

At the same time, dramatic television routinely subjects children to gothic brutalities. “*House*” does nothing to spare them gruesome operations and heinous diseases. “*Law and Order: SVU*” plucks practically every other victim from the ranks of infants or 12-year-olds; the criminals are often still in high school. A glance at the episode summaries on the show’s Web site reveals entries like: “Detective Benson goes undercover as a Madame to investigate the murder of a child prodigy living a double life.” On “*Medium*,” a series about a psychic in the employ of the Phoenix district attorney’s office, children are hurt all the time.

The popularity of these narratives — of demonstrating again and again that the thinnest membrane separates a child’s welfare from the grossest injury — is reflected in the arc of Picoult’s career. Picoult began writing when she graduated from Princeton in the late ’80s, but it was not until her 1998 novel, “*The Pact*,” which dealt with the apparent suicide of a 17-year-old girl, that she began to develop an impressive readership. Now she frequently tours the world, sometimes for three consecutive months, giving readings and appearing, for instance, on the South African version of “*Oprah*.” “*My Sister’s Keeper*,” which was released in 2004, has been published in more than 40 countries; her last six books have sold more than five million copies in the United States alone, hundreds of thousands of them in hardcover. She receives approximately 250 e-mail messages from fans daily and replies to every single one. “It is almost a responsibility,” she says. “If there are all these books in the world and someone picks yours, you should say thank you; it is just good manners.” After a recent and entirely unscientific analysis of her correspondence, she determined that 49 percent of her letters were coming from men, a fact that underscores her subject’s imaginative hold on parents, regardless of sex.

While Picoult’s notion of what constitutes domestic incident may stretch ideas of plausibility, it rests on a level of *forensic* detail that requires wide-ranging research. In her latest, “*Handle With Care*,” for instance, a New England couple bears a daughter with severe osteogenesis imperfecta, a progressively deforming bone disorder marked by repetitive fractures and stunted growth. Treating her requires a sultan’s resources. After a period of wrangling over the ethics of litigation, the couple embark on a





wrongful-birth suit against the obstetrician, claiming she missed the early signs of the condition in utero and thus never gave the parents the option of terminating the pregnancy.

To write such books, Picoult relies on extensive reading and conversations with a team of doctors, lawyers and judges. For her novel “Change of Heart,” about a sexually abused and murdered girl, another in need of a heart transplant and a death-row inmate whom some see as a Christ figure, Picoult invoked the Gnostic Gospels and talked with the religious scholar Elaine Pagels.

When I met her in Boston, Picoult was spending time at Shriners burns hospital. “The woman I was shadowing was worried about me being able to handle the incredibly graphic wounds — these kids were burned over 80 percent of their bodies — when it was the emotional component that rocked me,” she said. “Each time we left a room, I’d ask how the burns happened. One girl, not much older than my daughter, had fallen into a bonfire.”

Picoult is neither squeamish nor earnestly dour when discussing her material, and she realizes the extent to which her cheerful demeanor is at odds with her content. The daughter of a Wall Street analyst and a schoolteacher, she grew up on Long Island with a younger brother who eventually followed her to Princeton. It was there that she met her husband, Tim van Leer, who like her was on the university’s rowing team. Picoult spoke of him glowingly. “He is gorgeous,” she said. Her considerable earnings have made it possible for him to run his antiques business as a philanthropy, the proceeds going to a charity for the homeless. They live in Hanover, N.H., with their children, 10 chickens, eight ducks, two geese and a pair of miniature donkeys.

Her daily routine is equally idyllic. Every morning at 5:30, Picoult hikes with a friend; she writes until her children return home from school and then devotes the afternoon to them. Every year, her 15-year-old son, Jake, joins her in writing a children’s musical, which is performed to raise money for a charity that supports orphans with H.I.V. and AIDS in Zimbabwe. Recently Jake traveled with a school choral group to sing at Notre Dame Cathedral. In the fall, her oldest son, Kyle, will begin his freshman year at Yale. But Picoult has also spent a portion of her postcollege life thinking about children more formally. She completed a master’s in education at Harvard, where she took a class with the psychologist Carol Gilligan, whose suggestion that growing up is a process of slow forgetting left a deep impression. Asked at the time to recall her adolescence, she found herself agreeing with the idea that the things we remember from those years are often the most vivid occasions of melancholy and humiliation. Picoult can summon up the memory of having her fingers smashed into a locker by a hallway bully but little else of her younger life in any great detail, she told me.

If such traumas insufficiently supplied her for a career in fiction, greater and seemingly more formative challenges awaited Picoult as a mother. At age 5, her son Jake came down with cholesteatoma, a benign tumor in his left ear. “It can get to the brain and kill you,” Picoult said. “So you’ve got to get rid of it. We took an experimental approach that required multiple surgeries” — 13 of them. “Had we used a more traditional approach,” she continued, “he would have been profoundly deaf.” For three years, he wore hearing aids and following two reconstructive surgeries developed functional if not stereophonic hearing. But she says she does not believe that it was this experience alone that set her on her thematic course. “I think I gravitate toward these subjects because I’m looking for answers and I don’t have them,” Picoult told me. “But mostly I think it is superstition. There is a part of me that believes that if I think about these issues, if I put myself through the emotional ringer, I somehow develop an immunity for my own family. Does writing a book about bullying protect your children from being bullied? No. I realize that this kind of thinking is completely ridiculous.”

It was not always the case that the imperiled child was at the center of American popular culture. In the ’50s, the best-selling novel “The Bad Seed,” which later became a Broadway play and then a movie, made the argument that severe behavioral problems in children were attributable to genetic bad luck rather than parental ineptitude. It is unfathomable now in an era of such fervent concern about children’s safety, and particularly their sexual safety, to consider that in 1964, Margaret Millar, a well-regarded crime writer (her 1955 book, “Beast in View,” beat out Patricia Highsmith’s “Talented Mr. Ripley” for an Edgar Award), wrote a novel, “The Fiend,” about a child molester in which the reader’s sympathies are directed not at the 9-year-old victim but rather at the pedophile who believes he is in love with her. In an introduction to a later edition of the book, Millar defended her allegiances: “There is no fiend in this book, only Charlie, a good-looking, rather bewildered young man who suffers from an illness for which no cause or cure has been found.”

By the 1980s, though, there was a sense that it was society’s obligation to worry about the fate of children, who were endangered even in the ostensibly safest environments — there, perhaps, more than



anywhere else. In the wake of the McMartin preschool case, in which a group of teachers in California were accused of ritually abusing their charges (no one was ever convicted), writers and television producers turned their attentions to the mounting fear that children were susceptible to rampant horror wherever they were. (This period also marked the beginning of the eating-disorder TV movie.) Jonathan Kellerman, a former child psychologist, was among the first of the detective novelists to capture the rising anxiety in "When the Bough Breaks," published in 1985, a book in which a group of well-to-do sexual predators make a cover out of a home for handicapped children. In Picoult's novels and in novels like Dennis Lehane's "Mystic River," and "Gone Baby Gone," the threat is found not so much in the wilderness of strangers and poorly vetted caregivers as it is within families, churches (Picoult's book "A Perfect Match" deals with clerical sex abuse), schools and other narrowly circumscribed communities, in which insularity proves an ineffective mechanism of protection.

Tellingly, Picoult does not see herself as a genre writer but rather as a purveyor of social commentary (as if the categories were mutually exclusive) and of what we might call service fiction. "Maybe the average reader is not facing the daily challenges of a mom whose child is dying of cancer, for example, but she probably had an argument with her teenager that morning about something inconsequential that left her feeling frustrated and certain there's no middle ground between them," she told me. Picoult said she hoped in some sense that her books were the way to that middle ground.

In her most compelling work, she shares with various crime writers the idea that the law is the child's greatest advocate. Often it is some representative of the legal universe who emerges to express the compassion families cannot. (In "Nineteen Minutes," the defense attorney develops a closer rapport with the school shooter than does his father, who cannot muster the resolve to visit his son regularly in prison.) It is worth noting that growth of children-in-peril literature (and its companion programming) has correlated with a rising judicial tendency to regard children as especially vulnerable victims. Community notification laws requiring law enforcement to make public information regarding registered sex offenders were introduced in the '90s. By 2006, the federal Adam Walsh Child Protection and Safety Act, named after a 6-year old who was kidnapped from a Florida mall and killed 25 years earlier, strengthened registration requirements and increased punishment for crimes against children. Jessica's Law, an aggressive 2005 Florida statute, copied by other states, did this as well, introducing a mandatory minimum sentence of 25 years and a lifetime of electronic monitoring for adults convicted of "lewd or lascivious" acts against children under 12.

Some children's advocates argue that such legislation makes manifest an inherent paradox in our treatment of children, given that a number of states have lowered the age at which children can be tried as adults and given that our foster-care system can best be described as broken. In this view, the laws merely echo public outrage, expressing fury rather than orchestrating dynamic solutions to systematic problems. In their own removed and implicit way, Picoult's novels access this disparity, the difference between what is said and what is done, the difference between parenting that assumes the shape of performed concern and parenting that takes the form of active tending. So much of the ugliness that transpires in her books could be prevented by a marginally greater degree of psychological caution.

And yet, at the same time, the ugliness is manifest for a reason. Picoult's books and the whole cultural machine devoted to maniacal worry about children often seem like a reflection of our collectively sublimated ambivalence about having children to begin with. "Harvesting the Heart," one of Picoult's early novels, deals with this explicitly, imagining an overwhelmed young mother leaving her newborn. In so many of her books children seem like more work than most ordinary people can handle. If Picoult's fiction means to say anything, it is that parenting undoes us perhaps more than it fulfills, and it makes a thousand little promises it can never keep.

Ginia Bellafante is a television critic for The New York Times.

<http://www.nytimes.com/2009/06/21/magazine/21picoult-t.html?ref=magazine>

Elgin Marble Argument in a New Light By MICHAEL KIMMELMAN

ATHENS — Not long before the new Acropolis Museum opened last weekend, the writer Christopher Hitchens hailed in this newspaper what he called the death of an argument. Britain used to say that Athens had no adequate place to put the Elgin Marbles, the more than half of the Parthenon frieze that Lord Elgin spirited off when he was ambassador to the Ottoman Empire two centuries ago. Since 1816 they have been prizes of the British Museum.



Meanwhile, Greeks had to make do with the leftovers, housed in a ramshackle museum built in 1874.

So the new museum that Bernard Tschumi, the Swiss-born architect, has devised near the base of the Acropolis is a \$200 million, 226,000-square-foot, state-of-the-art rebuttal to Britain's argument. From certain angles it has all the charm and discretion of the Port Authority terminal in Manhattan. Neighbors have been complaining all the way to the bank, housing values having shot up because of it. Inside, however, it is light and airy, and the collection is a miracle. Weathered originals from the Parthenon frieze, the ones Elgin left behind, are combined with plaster casts of what's in London to fill the sun-drenched top floor of the museum, angled to mirror the Parthenon, which gleams through wraparound windows. The clash between originals and copies makes a not-subtle pitch for the return of the marbles. Greece's culture minister, Antonis Samaras, on the occasion of the opening last week, said what Greek officials have been saying for decades: that the frieze, broken up, is like a family portrait with "loved ones missing." Mr. Samaras's boss, Greece's president, Karolos Papoulias, spoke less metaphorically: "It's time to heal the wounds of the monument with the return of the marbles which belong to it."

Don't bet the British will agree.

Inside the museum visitors ascend as if up the slope of the Acropolis via a glass ramp that reveals, underfoot, ancient remains excavated during the building's construction. (They will eventually be opened to the public.) It's a nice touch. On the second floor archaic and early classical statues mill about a big gallery like a crowd in an agora, a curatorial and architectural whimsy that risks visitors missing works like the "Kritios Boy," which nearly hides to one side.

As for the caryatids from the Erechtheion and the sculptural remains of the Temple of Athena Nike, including the sexy "Sandal Binder," works of textbook import, they look a bit stranded on a balcony and in a passageway because the museum, save for the Parthenon floor, doesn't have regular spaces. Free circulation puts everything on equal footing (this is the birthplace of democracy, after all), but the flip side of this layout is the failure to make priorities clear, which art museums exist to do.

That said, Athens needs new modern landmarks. The city is choked by slapdash buildings thrown up after the junta fell during the early 1970s. Public monuments ape ancient palaces, badly. Nikos Dimou, a prominent writer here, recalled that when a show of the British modern sculptor Henry Moore arrived years ago: "People complained about bringing monstrous forms to the land of beauty. Ninety percent of cultured Greeks even today live with this classical sensibility."

A generation or two of well-traveled, environmentally conscious, globally wired Greeks has since come of age, and the Elgin Marbles debate now represents a kind of luxury that Greece has earned. It began with the actress Melina Mercouri during the 1980s, her publicity campaign coinciding with the rise of a

populist leader, Andreas Papandreou, whose slogan was “Greece for the Greeks.” It has evolved into a less glamorous tangle of diplomatic and legal maneuverings, with Greece lately recovering some 25 antiquities from various countries, including some additional stray fragments from the Parthenon.

“This issue unifies us,” Dimitris Pandermalis, the Acropolis Museum’s director, said the other day, never mind that surveys show how few of them actually bother to visit the Acropolis past grade school.

As to whether Elgin had legal authority to remove the marbles, the Ottomans being the ruling power, as the British maintain, Mr. Pandermalis paused. “The problem is not legal,” he decided. “It’s ethical and cultural.” George Voulgarakis, a former culture minister, wasn’t so circumspect when asked the same question. He said, “It’s like saying the Nazis were justified in plundering priceless works of art during the Second World War.”

“I understand what museums fear,” Mr. Voulgarakis added. “They think everything will have to go back if the marbles do. But the Acropolis is special.”

That’s what the Greeks have insisted for years when arguing why the frieze belongs to Greece, but they also say the frieze belongs to the world when pointing out why it doesn’t belong to the British. The frieze in fact belonged to the Parthenon, a building here and nowhere else, the best argument for repatriation, except the idea now is not to reattach the marbles where they came from but to move them from one museum to another, from the British Museum to the new Acropolis Museum, albeit next door — a different matter, if not to the Greeks.

“It’s the fault of a German,” Mr. Dimou said about Greek pride in this cause. He was referring to Johann Winckelmann, the 18th-century German art historian whose vision of an ancient Greece “populated by beautiful, tall, blond, wise people, representing perfection,” as Mr. Dimou put it, was in a sense imposed on the country to shape modern Greek identity.

“We used to speak Albanian and call ourselves Romans, but then Winckelmann, Goethe, Victor Hugo, Delacroix, they all told us, ‘No, you are Hellenes, direct descendants of Plato and Socrates,’ and that did it. If a small, poor nation has such a burden put on its shoulders, it will never recover.”

This myth required excavators on the Acropolis during the 19th century to erase Ottoman traces and purify the site as the crucible of classicism. The Erechtheion had been a harem, the Parthenon a mosque.

“But Greek archaeology has always been a kind of fantasy,” Antonis Liakos, a leading Greek historian, noted the other day. The repatriation argument, relying on claims of historical integrity, itself distorts history.

For their part, the British also point out that the marbles’ presence in London across two centuries now has its own perch on history, having influenced neo-Classicism and Philhellenism around the globe. That’s true, and it’s not incidental that the best editions of ancient Greek texts are published by British, French, Americans and Germans, not Greeks. But imperialism isn’t an endearing argument.

So both sides, in different ways, stand on shaky ground. Ownership remains the main stumbling block. When Britain offered a three-month loan of the marbles to the Acropolis Museum last week on condition that Greece recognizes Britain’s ownership, Mr. Samaras swiftly countered that Britain could borrow any masterpiece it wished from Greece if it relinquished ownership of the frieze. But a loan was out. Pity. Asked whether the two sides might ever negotiate a way to share the marbles, Mr. Samaras shook his head. “No Greek can sign up for that,” he said.

Elsewhere, museums have begun collaborating, pooling resources, bending old rules. The British Museum, the Metropolitan Museum of Art, the Louvre and other great public collectors of antiquity have good reason to fear a slippery slope if the marbles ever do go back, never mind what the Greeks say. At the same time the Acropolis Museum plays straight to the heart, sailing past ownership issues into the foggy ether of a different kind of truth. It’s the nobler, easier route.

Looting antiquities obviously can’t be tolerated. Elgin operated centuries ago in a different climate. The whole conversation needs to be reframed. As Mr. Dimou asked, “If they were returned, would Greeks be wiser, better? Other objects of incredible importance are scattered around Greece and no one visits them.” Mr. Liakos put it another way: “It’s very Greek to ask the question. Who owns history? It’s part of our nationalist argument. The Acropolis is our trademark. But the energy spent on antiquity drains from modern creativity.”

The new museum finally casts Melina Mercouri’s old argument in concrete. The opportunity is there.

<http://www.nytimes.com/2009/06/24/arts/design/24abroad.html?ref=design>

Headless Bodies From a Bottomless ImaginationBy **DEBORAH SONTAG**

LONDON

IN his Victorian house in the East End here Yinka Shonibare, the British-Nigerian conceptual artist, perched on an exercise ball at the wooden table in his book-crammed study, sipping peppermint tea and examining a shipment of faux oysters on the half shell.

A stationary hand cycle sat beside him, an electric wheelchair across from him. One of Bob and Roberta Smith's slogan paintings, "Duchamp stinks like a homeless person," hung above him, and a tuna on toast prepared by his housekeeper was sandwiched between a vase of yellow tulips and a stack of Dante volumes: "Inferno," "Purgatorio" and "Paradiso."

It was a small tranquil moment in the midst of a whirlwind time for Mr. Shonibare, whose theatrically exuberant work, with its signature use of headless mannequins and African fabrics, will be featured in a major midcareer survey at the [Brooklyn Museum](#) starting Friday. The exhibition includes paintings, sculptures, large-scale installations, photographs and films.

Erudite and wide ranging, Mr. Shonibare, at 47, is a senior figure in the British art world but one who intentionally eludes easy categorization. A disabled black artist who continuously challenges assumptions and stereotypes — "That's the point of my work really," he said — Mr. Shonibare makes art that is sumptuously aesthetic and often wickedly funny. When he deals with pithy matters like race, class, disability, colonialism and war, he does so deftly and often indirectly.

"I don't produce propaganda art," he said. "I'm more interested in the poetic than the didactic." On that gray May day in the East End, Mr. Shonibare was trying to decompress after directing a weeklong photo shoot that involved 25 live snakes, 14 nude models, 6 pigs and 2 lamb's heads. Inspired by Dante, [Arthur Miller](#), Gustav Doré and the financial crisis, the shoot was a work in progress, "Willy Loman: The Rise and Fall," which seeks to depict what happens after the death of the salesman. (Hint: It's hellish.)

At the same time Mr. Shonibare was preparing for a trip to Jerusalem, where he is a guest curator at the Israel Museum. He was granting an hours-long interview, interrupted periodically by his plumber — "Do you happen to know where the stopcock is, mate?" — and he was evaluating the oysters for inclusion alongside a peacock with gilded beak in a 19th-century dinner party installation at the [Newark Museum](#).

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“I’m juggling a few things, yeah,” said Mr. Shonibare, who in contrast to his bold and lavish work, is disarmingly gentle and restrained in person.

Because of a condition that left him partially paralyzed, Mr. Shonibare’s head lists to the right, as if being tugged there by a few of his jaunty dreadlocks. This often makes it look as if he were cocking his head to see things more clearly. But that impression is misleading because, as Arnold L. Lehman, director of the Brooklyn Museum, put it, his is the sure gaze of a “visionary” artist: “He’s able to juggle so many different ideas so brilliantly and to express them in such an immensely appealing and extraordinarily visual way.”

Mr. Shonibare is not without his critics in England. The London Evening Standard, for instance, has called his focus on cultural identity “labored, repetitive and a little last decade.” But his work is consistently requested for exhibition and purchase by museums around the world, according to his dealers, and he is rarely without a significant show or commission. The Brooklyn exhibition is his most comprehensive to date. Organized by the Museum of Contemporary Art in Sydney, it will travel in November to the Museum of African Art of the Smithsonian Institution in Washington. From July to January Mr. Shonibare’s dining room installation will be displayed at the Newark Museum. Apart from Mr. Shonibare’s gallery, which is in the tony Mayfair area, his life is concentrated in the East End, which is gentrifying but still mixed. His drawing studio is there, as are the private club where he socializes, the warehouse that he is converting into an artists’ space, and his late-19th-century house. He lives alone, across the street from his 18-year-old son, Kayode, who is studying computer game design. When Mr. Shonibare was about his son’s age and just starting at the Wimbledon College of Art, he felt faint one day and collapsed. Two weeks later he woke up in a hospital unable to move. The diagnosis was transverse myelitis, an inflammation across the spinal cord, and the prognosis was grim: complete paralysis.

The following year, in the hospital and a rehabilitation center, was “my bottom, bottom period,” he said. But gradually he regained considerable function, and after three years in a wheelchair, he once again walked (although he still sometimes uses a chair).

Most important to Mr. Shonibare in 1984 he was able to return to art school, this time the Byam Shaw School of Art in London, which offered some assistance.

“I found out that with a bit of help I was O.K.,” he said. “I could do most things.”

That Mr. Shonibare became a conceptual artist who delegates much of the production of his labor-intensive projects to a network of other artists is partly a result of his disabling illness. Another product, he said, has been a keen consciousness of his own mortality that has made him more appreciative of beauty.

The seminal moment in Mr. Shonibare’s artistic formation, however, was kindled by an encounter at Byam Shaw during a period when he was “making art about Perestroika.”

One day his tutor confronted him. “Why are you making work about Perestroika?” the tutor, a white Briton, asked. “You are African, aren’t you? Why don’t you make authentic African art?”

At first Mr. Shonibare was taken aback. “I tried to figure out what he meant by authentic African art,” he said. “I didn’t know how to be authentic. What would I do if I was being authentic?”

Born in England in 1962 when his father was studying law there, Mr. Shonibare was raised biculturally. His family returned to Nigeria when he was 3 but kept a house in South London, where he spent summers. Mr. Shonibare grew up in Lagos singing “London Bridges” and watching “Sesame Street.” He spoke Yoruba at home, English at school. He felt privileged, not disadvantaged.

“I didn’t feel inferior to anyone,” he said, adding, with a laugh, “If anything, I felt they were inferior to me.”

But the tutor saw him as “someone of African origin, and there are things associated with that,” Mr. Shonibare said. “I should have actually understood all along that there is a way in which one is perceived, and there’s no getting away from it. And I realized that if I didn’t deal with it, I would just be described forever as a black artist who doesn’t make work about being black.”

Right then, Mr. Shonibare said, he found his artistic *raison d'être*. “I realized what I’d really have to deal with was the construction of stereotypes, and that’s what my work would be about.”

In search of authentic African-ness Mr. Shonibare visited an African fabric shop in the Brixton market in South London, discovering, to his amazement, that the best African fabric was actually manufactured in the Netherlands and exported to Africa. Further, the Dutch wax prints, as they are known, were originally inspired by Javanese batiks.

This idea, that a fabric connoting African identity was not really African, delighted the budding conceptual artist. “The material was the idea,” he said. From that point forward the African fabric was his medium and his message.

He used it first as his canvas — stretching the prints, then painting on them — and later to make his costumes, which are usually Victorian, the Victorian era being the period of British history when Africa was colonized, thus providing him not only with ruffles and bustles but also with what he called the “lovely irony” of contrasting fabric and style.

“My tutor wanted me to be pure African,” Mr. Shonibare said “I wanted to show I live in a world which is vast and take in other influences, in the way that any white artist has been able to do for centuries.” Mr. Shonibare came of age artistically in the 1980s, during the heyday of the Afro-Caribbean BLK Art Group, whose fierce work protested the perceived racism of the British art world. But Mr. Shonibare, living comfortably in his parents’ house in London, felt no kinship with them. “I had nothing to be angry about,” he said.

For that matter, Mr. Shonibare, a born contrarian, was not constitutionally designed to belong to any art movement, not even the one with which he was associated by circumstance, the Young British Artists. Like them he attended Goldsmiths College (after Byam Shaw), overlapping for a time with Damien Hirst, the most prominent of the group. And like them Mr. Shonibare got his big break from the collector Charles Saatchi.

In the mid-1990s, at a time when Mr. Shonibare was supporting himself by working at a disability arts organization, Mr. Saatchi bought two of his pieces, for what the artist then considered an astronomical sum — about £8,000 (about \$13,000 today) each. Mr. Shonibare estimates their current value as “in the six figures;” one is now in the Museum of Modern Art’s collection.

The other, “Double Dutch” (1994), shows one way that Mr. Shonibare adjusted creatively to his physical limitations. He could not handle huge canvases. So in “Double Dutch” he fragmented a large work into manageably sized pieces — 50 rectangles of African fabric — and arranged them in a 10-by-20-foot grid, incorporating the wall, painted an intense pink, into the artwork.

Because of Mr. Saatchi, Mr. Shonibare was included among the Young British Artists in the “Sensation” exhibition in 1997 — the show that, when it moved to the Brooklyn Museum, so provoked Rudolph W. Giuliani, the New York mayor, with a black Madonna adorned with elephant dung that he threatened to cut the museum’s funds.

But Mr. Shonibare was not himself a shock artist. He was not, like Mr. Hirst, suspending sharks in formaldehyde. Rather, at a time when decorative was a dirty word, he was making works of seductive beauty whose bite was only gradually felt.

Part of the bite lay in the headlessness of his mannequins, with the decapitation that is intrinsically violent but never made graphic. Mr. Shonibare said that he conceived of the headlessness as a joke related to the revenge killings of aristocrats in the French Revolution. “The idea of bringing back the guillotine was very funny to me,” he said.

Additionally, because Mr. Shonibare does not like his figures to be racially identifiable, chopping off their heads helps. (The fiberglass bodies are mixed race, “kind of coffee colored,” he said.)

This does not mean that race is invisible in his art. He himself is the centerpiece of a couple of his elaborately staged photographic works, like “Diary of a Victorian Dandy” (1998). Clearly identifying with the lead character as an outsider who gains entry to society through wit and style, Mr. Shonibare cast himself as a dandy who is fussed over in bed by white maids here, looked up to at a billiards table by white associates there.

In what he calls his “zeitgeist-inspired” art Mr. Shonibare prefers to set his pieces in a different historical era so as not to be hamstrung by unfolding events. In 2003, when he was thinking about American imperialism and the Iraq war, Mr. Shonibare made “Scramble for Africa.” In that large installation he positioned 14 headless — “and brainless” — men at a conference table adorned with the map of Africa, as if they were European leaders dividing up the continent in the late 1800s. “It is possible,” he said dryly, “to learn from history.”

In his home on that day when Mr. Shonibare was supposedly decompressing, his studio manager, Ann Marie Peña, reviewed several pending matters with him, including details about the Willy Loman piece, which will be displayed at the Stephen Friedman Gallery in London in September. Ms. Peña showed him a photograph of the sculptor’s dummy for the “car crash Willy Loman,” the salesman — right after the death imagined for him — which will be positioned in a crashed vintage car at the entrance.

“Is his costume being distressed?” Mr. Shonibare asked.

“Distressed and sullied — and the shirt could be ripped,” Ms. Peña answered.

“O.K.,” Mr. Shonibare said after a pause. “But I don’t want to be obvious. No blood or anything. And not too immaculate with the costume. He’s a man down on his luck. He can’t afford to keep the bling going.” Over the last few years Mr. Shonibare’s stature as an artist has grown. He was short-listed for the Turner Prize, the prestigious British art award, and designated a member of the British Empire by Prince Charles (after which he promptly appended MBE to his name).

A constant demand for new work places continuous pressure on Mr. Shonibare’s network of collaborators — the sculptor, costume designer, photographer and others — whose assistance he sees as part of a historic and continuing tradition in artistic studios. “In my case I have a disability,” he said, “but Jeff Koons is physically fit, Damien Hirst is physically fit.”

Mr. Shonibare paused, then continued: “You know, all of the things that are supposed to be wrong with me have actually become a huge asset. I’m talking about race and disability. They’re meant to be negatives within our society. But they’re precisely the things that have liberated me. Because they are me, what I express. So it has not been a negative thing to be who I am but a positive thing.

“Do you know what I mean?”

<http://www.nytimes.com/2009/06/21/arts/design/21sont.html?ref=design>

| NEW JERSEY Industrialization, Illustrated

By **BENJAMIN GENOCCHIO**

During the Great Depression — an era that has a lot of resonance these days — the world was in thrall to

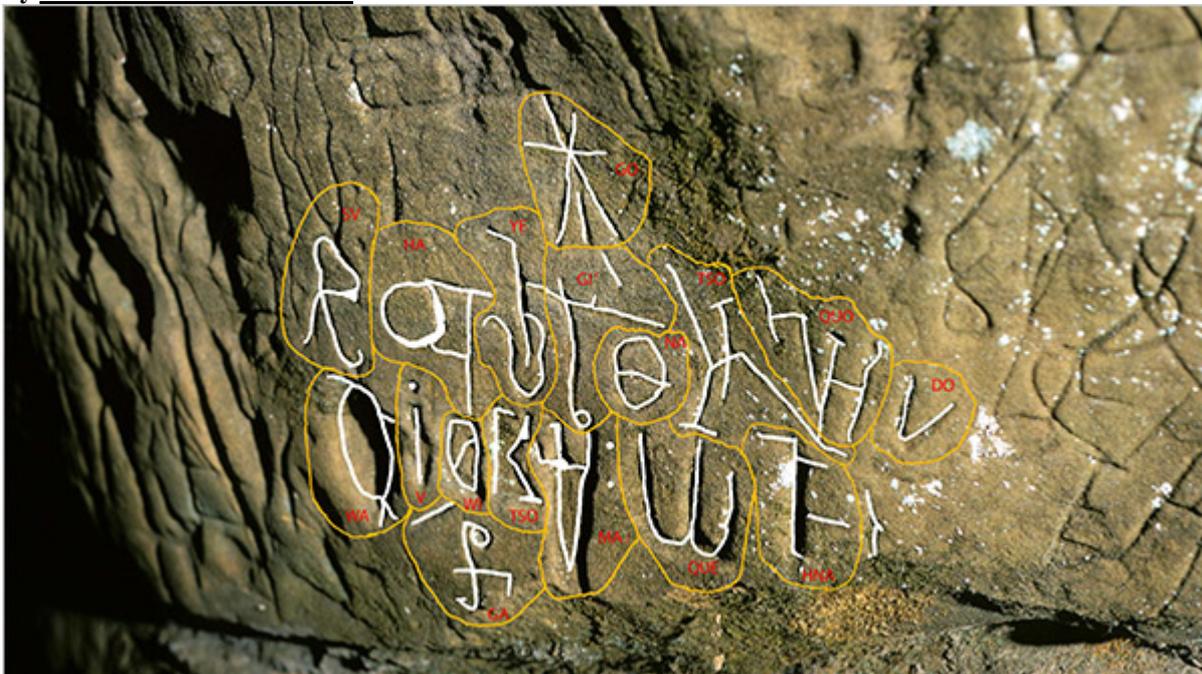


an intriguing style of Cubist-inspired, semi-abstract landscape painting known as Precisionism. The name derives from a preference among the movement's artists for sharp-edged geometric forms and precise, clean lines eliminating any trace of the human hand. According to textbooks, the artists associated with this movement were Charles Demuth, Edward Hopper, Charles Sheeler, Paul Strand and Georgia O'Keeffe. But there were other devotees, as one discovers in "Industrial Strength: Precisionism and New Jersey," an enlightening show at the Jersey City Museum. The exhibition brings together about 45 works by some of the lesser known artists of the movement, all of whom either lived or worked at one time in New Jersey. Aside from the technique, a defining characteristic of Precisionism was a reverence for industrialization and the modernization of the landscape; these artists were in love with the idea of urban and industrial sprawl. Factories, machinery, ports, bridges and freeways, along with other symbols of American industrial might, were popular themes, and they dominate the imagery in the present show. The bulk of the art dates from the 1930s, when Precisionism was at its height. A range of media is represented, but most of the works are black and white lithographs. These, for me, most accurately and dramatically convey the spirit of the times. The first thing you see as you enter are two panoramic lithographs by Louis Lozowick (1892-1973) of Newark. He was commissioned in 1943 by the Quinn & Boden Company, a book publisher (which closed in 1978), to make images of its factory in Rahway. The resulting pictures are also among the best works of art here. The exhibition is arranged by themes, beginning with depictions of factories, bridges and warehouses. Among these works are superb pictures by Werner Drewes (1899-1985) and Victoria Hutson Huntley (1900-1971), two of the best-known artists associated with New Jersey Precisionism. Mr. Drewes's lithograph "Grain Elevator V" (1926) is a masterpiece of visual simplicity, the artist capturing the monumental scale and thickness of the building's concrete walls. The following section assembles views of the city, most but not all depicting New York. Especially evocative is Jan Matulka's "Arrangement, New York" (c. 1925), a rendering of the New York skyline in a style reminiscent of the work of the French Cubist Fernand Léger. Skyscrapers with chimneys billowing smoke are seen crowded together against a toxic-looking black-gray-green sky. It is hard in our own time to appreciate the genuine excitement that surrounded industrialization and urban modernity in the early 20th century. A sense of it lingers in a work by Riva Helfond (1910-2002), a little-known artist who taught painting at Union County College in Cranford. "The Monster (The Dig)" (1938), a lithograph, captures the chaotic intensity of an urban excavation project. Among the scenes of factories and industrial silhouettes, I was especially taken by Mr. Lozowick's pencil drawing "Kopper's Coke" (1960), a panoramic nighttime image of a massive smelter at the water's edge that gives off an eerie glow, lighting up the sky. It celebrates the spectacle and grandiosity of modern industry. Precisionism fell out of favor in the 1940s, when American art turned toward Abstract Expressionism. But many artists continued to paint in the style, including Elsie Driggs (1898-1992), who lived for many years in Lambertville. Late in life she painted "Hoboken" (1986), an image of power lines and rooftops along a built-up street. It is atmospheric, keenly observed and sensual — a combination of skill and feeling that seems simple but is really very complicated. Either way, it's magnificent. "Industrial Strength: Precisionism and New Jersey," *Jersey City Museum, 350 Montgomery Street, through Aug. 23. Information: jerseycitymuseum.org, or (201) 413-0303.*

<http://www.nytimes.com/2009/06/21/nyregion/21artsnj.html?ref=design>

Carvings From Cherokee Script's Dawn

By **JOHN NOBLE WILFORD**



The illiterate Cherokee known as Sequoyah watched in awe as white settlers made marks on paper, convinced that these “talking leaves” were the source of white power and success. This inspired the consuming ambition of his life: to create a Cherokee written language.

Born around 1770 near present-day Knoxville, Tenn., he was given the name George Gist (or Guess) by his father, an English fur trader, and his mother, a daughter of a prominent Cherokee family. But it was as Sequoyah that around 1809 he started devising a writing system for the spoken Cherokee language. Ten years later, despite the ridicule of friends who thought him crazed, he completed the script, in which each of the 85 characters represented a distinct sound in the spoken tongue, and combinations of these syllables spelled words. Within a few years, most Cherokees had adopted this syllabary, and Sequoyah became a folk hero as the inventor of the first Native American script in North America. It may be, as is often noted, that his achievement is the only known instance of an individual’s single-handedly creating an entirely new system of writing.

An archaeologist and explorer of caves has now found what he thinks are the earliest known examples of the Sequoyah syllabary. The characters are cut into the wall of a cave in southeastern Kentucky, a place sacred to the Cherokee as the traditional burial site of a revered chief. The archaeologist, Kenneth B. Tankersley of the University of Cincinnati, said in an interview recently that this was “one of the most fascinating and important finds in my career,” yielding likely insights into “the genius of Sequoyah.” Roughly inscribed on the limestone wall, Dr. Tankersley said, were 15 identifiable characters from the syllabary. They are accompanied by a date, apparently carved by the same hand. Part of the date is hard to read, but it appears to be either 1818 or 1808, at least a year earlier than any previously known records of the script.

Dr. Tankersley discovered the cave writing in 2001 and in years of subsequent research established that Sequoyah often visited caves for inspiration while working on the syllabary and made several visits to the region, close to the Tennessee border in what is now Clay County. He had relatives there, the archaeologist said, and could have left the marks there himself.

Dr. Tankersley referred to the discovery in a paper on Cherokee rock art presented last year at a meeting of the Society of American Archaeology. Further details and interpretation were reported in an article in the current issue of *Archaeology*, the magazine of the Archaeological Institute of America.

If the date proves to be 1808, Dr. Tankersley said, Sequoyah was probably the only one then with knowledge of the writing and so must have carved the characters himself. If it was 1818, he said, it was possible that someone he taught had made the characters.

Specialists in Cherokee writing have yet to analyze the findings. William D. Welge, director of research at the Oklahoma Historical Society, who oversees an extensive archive of Cherokee records, said it “was reasonable to think that Sequoyah or one of his students carved these writing symbols.”

Any new findings about Sequoyah, Mr. Welge said, are important because his invention of Cherokee writing promoted rapid strides in education and the culture of one of the largest Native American populations. Some crucial early steps in his development of the script had been lost, the archivist said, because Sequoyah’s wife had destroyed examples of his early efforts, thinking this “the devil’s work.” Dr. Tankersley was especially intrigued by some petroglyphs carved on the wall alongside the Cherokee characters. He said the glyphs appeared to include ancient Cherokee symbols as well as drawings representing bears, deer and birds.

Dr. Tankersley is a member of the Cherokee Nation who traces his ancestry to Red Bird, the murdered chief once buried in the cave. He said that he was investigating possible links between the traditional glyphs and a few of the symbols in Sequoyah’s script. If a link can be established, he added, the inscription may be “our Rosetta stone, enabling us to see where prehistory meets history.”

Janine Scancarelli, an authority on Cherokee writing formerly at the College of William and Mary, has written, “In their present form many of the syllabary characters resemble Roman, Cyrillic or Greek letters or Arabic numerals, but there is no apparent relationship between their sounds in other languages and in Cherokee.”

By some accounts, Sequoyah was a kind of Professor Henry Higgins who enlisted family members who had sharper ears for discriminating distinct sounds. They helped him divide spoken words into their constituent sounds, and to each sound he assigned a symbol drawn mostly, it is said, from an English spelling book. In the script, for example, Sequoyah’s own name reads:

The 15 characters on the cave wall — — do not spell any words. “They read almost like ABCs,” Dr. Tankersley said in the magazine article, suggesting that someone taught by Sequoyah may have been “practicing drawing them out just as we would practice our ABCs.”

While working on his invention, Sequoyah the silversmith, teacher and soldier traveled widely from North Carolina and Tennessee into Georgia and Alabama. In 1821, after he reached Arkansas, he and his daughter Ayoka demonstrated the writing to Cherokee leaders, who encouraged its instruction.

A Cherokee Baptist minister translated the New Testament using the syllabary, Dr. Tankersley said, and Sequoyah was asked to use the translation to teach Cherokee boys to write at the Choctaw Academy near Georgetown, Ky., which was run by a Baptist missionary society. Other missionaries in Oklahoma embraced the script in Bible and other book translations.

Within five years, according to the Tennessee Encyclopedia of History and Culture, “thousands of Cherokees were literate — far surpassing the literacy rates of their white neighbors.”

It was not long before the Cherokee were printing a newspaper and learning hymns (one sung to the tune of “Amazing Grace”) in the new script. But the story of Sequoyah and the newly literate Cherokee came to a sad ending.

Sequoyah had trekked all the way to Oklahoma, voluntarily joining new settlements. But these newcomers were soon followed by the infamous forced migration in the winter of 1838-39 of a multitude of Cherokees, who starved, grew sick and died on the Trail of Tears.

They were cast out of their homeland by order of President Andrew Jackson, the former general whom Sequoyah had loyally served as a soldier on the frontier in the War of 1812.

http://www.nytimes.com/2009/06/23/science/23cherokee.html?_r=1&ref=science&pagewanted=all

Obesity ops 'may cut cancer risk'

Weight-loss surgery could help women - but not men - reduce their risk of cancer, research suggests.



Obesity is known to increase the risk of many types of cancer, but it was unclear whether surgery to address the problem also cut the risk of cancer.

Now a Swedish study, published in *Lancet Oncology*, has shown that weight-loss surgery is associated with a 42% reduction in cancer levels in women.

Experts believe the surgery's impact on hormone levels could be key.

It is estimated that obesity is linked to 20% of all cancer deaths in women, and 14% in men in the western world.

A team from Sahlgrenska University Hospital, Gothenburg, set out to discover if weight-loss (bariatric) surgery could help to cut the risk.

BODY MASS INDEX

Calculated by dividing weight in kilograms by height in metres squared

Normal: 18.5 - 24.9

Overweight: 25 - 29.9

Obese: Above 30

Over an average period of 10.9 years, the researchers followed 2,010 obese patients who had undergone weight-loss surgery, comparing them with 2,037 obese who received other forms of treatment, or no treatment.

Over the study period, patients who had surgery lost an average of 19.9kg in weight, compared to an average of 1.3kg in the group who did not have surgery.

Among women, the number of first-time cancers was significantly lower (79) in the surgery group than in the non-surgery group (130).

But surgery appeared to have no effect on men's cancer risk, with 38 cases recorded in the surgery group, and 39 in the non-surgery group.

Wide-ranging effect

The beneficial effect of weight-loss surgery on women seemed to apply to a wide range of cancers.

However, exactly why the surgery had a beneficial effect remains a mystery - analysis could find no direct link with losing weight, or reducing food intake.

This suggests the surgery has a more subtle impact on cancer risk.

“ In the UK around 13,000 people a year could avoid cancer by maintaining a healthy bodyweight ”
Dr Julie Sharp Cancer Research UK

Dr Andrew Renehan, a cancer expert at the UK's University of Manchester, said the most likely explanation was that weight-loss surgery had an impact on hormone levels in the body.

Several common cancers are known to be linked to the female sex hormone oestrogen in particular.

Dr Renehan said it was possible that weight-loss surgery might also cut cancer risk for men, but that the effect might take many years to become apparent.

Dr Ian Campbell, medical director of the charity Weight Concern, agreed that hormone levels were probably the key, with weight-loss surgery reducing the amount of hormone-producing fat cells in the body.

"In obese men, the types of cancer most common are not so hormone sensitive and therefore not so directly influenced by weight loss," he said.

"However, it may also be due to the development of cancers at later stage in life in men.

"In men, obesity is often goes hand in hand with a nutrient-poor diet, and lack of exercise and so even when weight loss has been achieved through surgery, unless these lifestyle issues are addressed, significant increased risk of some cancers will remain."

Dr Julie Sharp, of the charity Cancer Research UK, said less drastic measures, such as healthy eating and taking exercise, were the best way to control weight.

"In the UK around 13,000 people a year could avoid cancer by maintaining a healthy bodyweight," she added.

Story from BBC NEWS:
<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8113148.stm>

Published: 2009/06/23 23:12:36 GMT

Himalayan glacier studies commence

By Navin Singh Khadka
Environment reporter, BBC News

After a long gap, scientists in Nepal have embarked on the first field studies of Himalayan glacial lakes, some of which are feared to be swelling dangerously due to global warming.



In May, they completed the field visit to the first location, a lake in the Everest region, in a series of studies.

They plan to conduct similar surveys of two other glacial lakes in the central and western part of the Nepalese Himalayas later in the year.

"We have started with Nepal, but we intend to extend studies to other Hindu Kush Himalayan countries," says Arun Bhakta Shrestha, a climate change specialist with the International Centre for Integrated Mountain Development (ICIMOD), which is carrying out the research alongside a number of government agencies.

"This is a part of our regional assessment of the floods such lakes can cause if they burst."

The Hindu Kush Himalayan region stretches between Burma in the east to Afghanistan in the west, showcasing spectacular snow-clad mountains, some of which are the world's highest.

Having returned from their first field visit, the scientists are now grappling with the data they collected on the body of water, known as Imja lake.

It will take some time before they release their final conclusions.

" I was shocked to see fresh water at that altitude, where I had seen nothing but snow and ice before "

Appa Sherpa, Nepal

But, sharing his initial observations, Pradeep Mool, a remote sensing specialist with the ICIMOD, said there was an air of change in and around Lake Imja.

"The area of the lake has become bigger and there are some changes in its end moraines [accumulations of debris]."

But, he added, "I would not call it alarming".

Witnessing change

While scientists are cautious when speaking about the changes, mountaineers have been more vocal.

There is talk among Sherpa climbers about what they say is fast glacial retreat and snow meltdown in the Himalayas.

Appa Sherpa, who has climbed Everest a record number of times said recently that he had seen fresh water at the height of above 8,000m on Everest.

"I was shocked to see fresh water at that altitude, where I had seen nothing but snow and ice before," he said on his return last month from his 19th climb to the highest peak.

This time he was on the Everest as a "climate witness", for green group WWF's campaign to raise awareness of the impact of climate change on the Himalayas.

It has been almost two decades since the first few field studies were done in the Himalayas. This gap in data-gathering and dearth of local climate change information has earned it the name "white spot".

Most of the studies have been desk-based, with the help of satellite imagery and computer simulations.

Such studies have shown that the average temperature in the Himalayas have been rising at the rate of 0.06C every year, fuelling fears that glaciers may be melting fast, and filling up glacial lakes.

One such study by the UN Environment Programme (Unep) and ICIMOD, nearly 10 years ago, warned that 20 glacial lakes in Nepal and 24 in Bhutan were swelling so rapidly that they could burst by 2009.

A burst lake would cause flash floods, which could sweep away buildings and roads or even whole communities in countries like Nepal and Bhutan.

This has already happened more than 30 times in and around Nepal in the last 70 years.

A glacial lake burst in Khumbu in the Everest region in 1985, washing away a hydropower station, a trekking trail and numerous bridges.

Invisible threat

There are around 3,300 glaciers in the Nepalese Himalayas and nearly 2,300 of them contain glacial lakes.

No one knows which of these are reaching breaching point. But these new field studies, starting with Imja, Thulagi and Tsho Rolpa glacial lakes, should begin to answer these important questions.

The Tsho Rolpa caused panic among locals until some water was drained from it almost ten years ago.

Ever since then, the threat from glacial lakes has lurked. But funding difficulties have meant that no field studies have taken place.

Things appear to be changing now.

"We have attempted to go beyond desk-based assessments, which were largely hazard focused," says Dr Shrestha.

"We are also considering more on risk as opposed to hazard, this means we are looking at physical, economic and social aspects.

Mr Mool said it was also about bringing specialists from different fields together.

"Through the findings from these studies, we are trying to link science, policy making and public awareness so that what we find becomes practically useful for the society."

Although the field studies are specific to glacial lakes, they could also indicate how rivers in the regions might change.

Major local rivers, like the Ganges, Bramhaputra, Meghna and Indus, have most of their tributaries fed by snow melt from Himalayan glaciers.

Previous studies and computer simulations have already shown that these rivers are likely to swell significantly and cause frequent flooding as glaciers melt rapidly due to global warming.

But, according to scientists, in the long term, when the glaciers have retreated, the rivers could dry up almost entirely during the dry season.

This could cause an unprecedented crisis in the water supply for millions of people in the region.

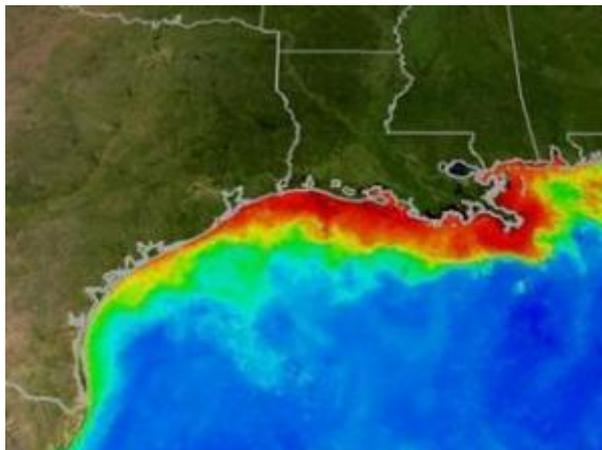
How soon could that could happen is something these unique field studies will perhaps show.

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8109389.stm>

Published: 2009/06/23 08:06:47 GMT

Large 2009 Gulf Of Mexico 'Dead Zone' Predicted



Mississippi dead zone in 2004. This year's Gulf of Mexico "dead zone" could be one of the largest on record, continuing a decades-long trend that threatens the health of a half-billion-dollar fishery. (Credit: Photo courtesy of NASA/Goddard Space Flight Center Scientific Visualization Studio)

ScienceDaily (June 24, 2009) — University of Michigan aquatic ecologist Donald Scavia and his colleagues say this year's Gulf of Mexico "dead zone" could be one of the largest on record, continuing a decades-long trend that threatens the health of a half-billion-dollar fishery.

The scientists' latest forecast, released June 18, calls for a Gulf dead zone of between 7,450 and 8,456 square miles—an area about the size of New Jersey.

Most likely, this summer's Gulf dead zone will blanket about 7,980 square miles, roughly the same size as last year's zone, Scavia said. That would put the years 2009, 2008 and 2001 in a virtual tie for second place on the list of the largest Gulf dead zones. It would also mean that the five largest Gulf dead zones on record have occurred since 2001. The biggest of these oxygen-starved, or hypoxic, regions developed in 2002 and measured 8,484 square miles.

"The growth of these dead zones is an ecological time bomb," said Scavia, a professor at the U-M School of Natural Resources and Environment and director of the U-M Graham Environmental Sustainability Institute.

"Without determined local, regional and national efforts to control them, we are putting major fisheries at risk," said Scavia, who also produces annual dead-zone forecasts for the Chesapeake Bay.

The Gulf dead zone forms each spring and summer off the Louisiana and Texas coast when oxygen levels drop too low to support most life in bottom and near-bottom waters.

The Gulf hypoxia research team is supported by the U.S. National Oceanic and Atmospheric Administration's Center for Sponsored Coastal Ocean Research and includes scientists from Louisiana State University and the Louisiana Universities Marine Consortium.

The forecast for a large 2009 Gulf hypoxic zone is based on above-normal flows in the Mississippi and Atchafalaya rivers this spring, which delivered large amounts of the nutrient nitrogen. In April and May, flows in the two rivers were 11 percent above average.

Additional flooding of the Mississippi since May could result in a dead zone that exceeds the upper limit of the forecast, the scientists said.



"The high water-volume flows, coupled with nearly triple the nitrogen concentrations in these rivers over the past 50 years from human activities, has led to a dramatic increase in the size of the dead zone," said Gene Turner, a lead forecast modeler at Louisiana State University.

Northeast of the Gulf, low water flows into the Chesapeake Bay shaped Scavia's 2009 forecast for that hypoxia zone.

The Bay's oxygen-starved zone is expected to shrink to between 0.7 and 1.8 cubic miles, with a "most likely" volume of 1.2 cubic miles—the lowest level since 2001 and third-lowest on record. The drop is largely due to a regional dry spell that lasted from January through April, Scavia said. Continued high flows in June, beyond the period used for the forecasts, suggest the actual size may be near the higher end of the forecast range.

"While it's encouraging to see that this year's Chesapeake Bay forecast calls for a significant drop in the extent of the dead zone, we must keep in mind that the anticipated reduction is due mainly to decreased precipitation and water runoff into the Bay," he said.

"The predicted 2009 dead-zone decline does not result from cutbacks in the use of nitrogen, which remains one of the key drivers of hypoxia in the Bay." Farmland runoff containing fertilizers and livestock waste—some of it from as far away as the Corn Belt—is the main source of the nitrogen and phosphorus that cause the Gulf of Mexico dead zone.

Each year in late spring and summer, these nutrients make their way down the Mississippi River and into the Gulf, fueling explosive algae blooms there. When the algae die and sink, bottom-dwelling bacteria decompose the organic matter, consuming oxygen in the process. The result is an oxygen-starved region in bottom and near-bottom waters: the dead zone.

The same process occurs in the Chesapeake Bay, where nutrients in the Susquehanna River trigger the event. In both the Gulf and the Bay, fish, shrimp and crabs are forced to leave the hypoxic zone. Animals that cannot move perish.

The annual hypoxia forecasts helps coastal managers, policy makers, and the public better understand what causes dead zones. The models that generate the forecasts have been used to determine the nutrient-reduction targets required to reduce the size of the dead zone.

"As with weather forecasts, the Gulf forecast uses multiple models to predict the range of the expected size of the dead zone. The strong track record of these models reinforces our confidence in the link between excess nutrients from the Mississippi River and the dead zone," said Robert Magnien, director of NOAA's Center for Sponsored Coastal Ocean Research.

U.S. Geological Survey data on spring river flow and nutrient concentrations inform the computer models that produce the hypoxia forecasts.

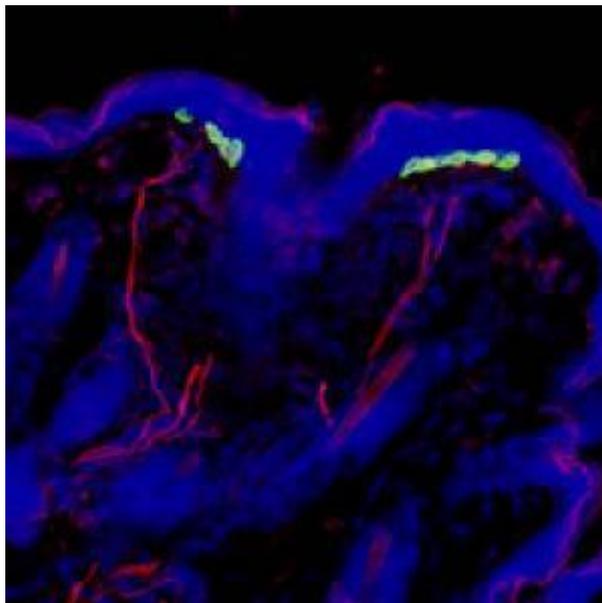
The official size of the 2009 hypoxic zone will be announced following a NOAA-supported monitoring survey led by the Louisiana Universities Marine Consortium on July 18-26. In addition, NOAA's Southeast Area Monitoring and Assessment Program's (SEAMAP) is currently providing near real-time data on the hypoxic zone during a five-week summer fish survey in the northern Gulf of Mexico.

Adapted from materials provided by [University of Michigan](#).

<http://www.sciencedaily.com/releases/2009/06/090618124956.htm>



Link Between Light Touch And Merkel Cells Solves 100-year Mystery



Atoh1 expression in Merkel cells in the skin (green) and the nerves that contact them (red). (Credit: Image courtesy of Baylor College of Medicine)

ScienceDaily (June 24, 2009) — Light touch – the sense that lets musicians find the right notes on a keyboard, a seamstress revel in the feel of cool silk, the artisan feel a curve in material and the blind read Braille – truly depends on the activity of Merkel cells usually found in crescent-shaped clusters in the skin, said researchers from Baylor College of Medicine and colleagues in a report that appears in the current issue of the journal *Science*.

"Human, primates and any animal that relies on hands for dexterity use their Merkel cells to feel texture and shape," said Dr. Ellen Lumpkin, assistant professor of neuroscience, molecular physiology and biophysics and molecular and human genetics at BCM and a senior author of the report. "Merkel cells are not like pain fibers. They exist in special areas of the skin to feel light touch. We have a lot of them on our fingertips and also on our lips."

However, while many scientists thought Merkel cells were key elements of light touch, they could never directly prove the link. The topic has been debated for more than 100 years, since the cell were first described in 1875 by German scientist Friedrich Sigmund Merkel (for whom they are named).

In cooperation with Dr. Huda Zoghbi (another senior author), Lumpkin, first author Dr. Stephen Maricich (now of Case Western Reserve University in Cleveland, Ohio), and colleagues generated mice that lacked a gene called *Atoh1* in some areas of the body and, as a result, had no Merkel cells in skin located below the head. Experiments on these mice directly demonstrate the link between Merkel cells and touch in way that can be seen and heard.

That is probably the most significant thing about the paper, said Maricich. While Merkel himself first postulated the link between the cells and light touch, "this is the first direct evidence," said Maricich, who plans to continue working with the cells, determining the progenitor cells from which they arise and determining how they relate to human disease.

A decade ago, Zoghbi, Dr. Hugo Bellen and other BCM researchers identified *Atoh1* (also called *Math1*), and were the first to show it affects hearing and proprioception – the sensing of where parts of one's body are in space. (See figures 1 and 2)

Zoghbi is professor of pediatrics, molecular and human genetics, neurology and neuroscience at BCM and is also a Howard Hughes Medical Institute investigator.

"To our knowledge, Atoh1 is the first gene shown to be necessary for the specification of Merkel cells," the authors noted in their paper.

To further prove their point, the researchers used special equipment to record tiny electrical impulses that touch elicits from neurons in the skin. In mice that lacked Merkel cells, the skin was missing touch receptors with high spatial resolution (the hallmark of Merkel cells), but was still innervated by other touch-sensitive neurons. While Merkel cells are probably not involved in proprioception, Merkel cells and hair cells (the sensory cells of the ear) "allow you to manipulate objects with high spatial resolution and discrimination of sound. That's what I think is beautiful about Atoh1, the Merkel cell and the hair cell," said Lumpkin.

"These cells are the first way our body interacts with the outside world," she said. "Both hair cells and Merkel cells tell us what and when at the finest level we humans relate to our environment."

A decade ago, Lumpkin chose to study Merkel cells at the same time that Zoghbi and Bellen first announced their discovery that Atoh1 (Math1) is necessary for inner ear hair cells. She recognized that the two fields would someday have importance for one another. Merkel cells are not limited to fingertips or lips, where tactile sensitivity is highest. They are also found in hairier parts of human skin as well as on the bodies of all vertebrates, from fish to primates.

In mice and other nocturnal animals, Merkel cells in the body might be important for maneuvering in the dark. Lumpkin and Maricich plan to use the mice lacking Merkel cells to directly test this possibility.

This is another important component of the Atoh1 network that helps people realize where they are in space, said Zoghbi. While the specific activity of Merkel cells permit light touch and the "what and when" of activity, "Atoh1-dependent neurons are processing that information," she said.

Lumpkin sees the finding as a stepping stone to even more basic answers. "Bigger than that, we don't know how any mammalian touch receptor works," she said. "What genes allow them to function as light or painful touch receptors? This project gives us the experimental handle with which to start to dissect the genetic basis of touch."

Others who took part in this research include BCM Neuroscience graduate students Scott A. Wellnitz and Aislyn M. Nelson, and Daine R. Lesniak and Gregory J. Gerling of the University of Virginia.

Funding for this work came from the National Institutes of Health, the McNairs Scholars Program, the National Library of Medicine, the Defense Advanced Research Projects Agency and the Howard Hughes Medical Institute.

Journal reference:

1. Stephen M. Maricich, Scott A. Wellnitz, Aislyn M. Nelson, Daine R. Lesniak, Gregory J. Gerling, Ellen A. Lumpkin, and Huda Y. Zoghbi. **Merkel Cells Are Essential for Light-Touch Responses.** *Science*, 2009; DOI: [10.1126/science.1172890](https://doi.org/10.1126/science.1172890)

Adapted from materials provided by [Baylor College of Medicine](http://www.baylor.edu).

<http://www.sciencedaily.com/releases/2009/06/090618143956.htm>

Morning People And Night Owls Show Different Brain Function



Scientists have found that there are significant differences in the way our brains function depending on whether we're early risers or night owls. (Credit: iStockphoto)

ScienceDaily (June 24, 2009) — Are you a "morning person" or a "night owl?"

Scientists at the University of Alberta have found that there are significant differences in the way our brains function depending on whether we're early risers or night owls.

Neuroscientists in the Faculty of Physical Education and Recreation looked at two groups of people: those who wake up early and feel most productive in the morning, and those who were identified as evening people, those who typically felt livelier at night. Study participants were initially grouped after completing a standardized questionnaire about their habits.

Using magnetic resonance imaging-guided brain stimulation, scientists tested muscle torque and the excitability of pathways through the spinal cord and brain. They found that morning people's brains were most excitable at 9 a.m. This slowly decreased through the day. It was the polar opposite for evening people, whose brains were most excitable at 9 p.m.

Other major findings:

- Evening people became physically stronger throughout the day, but the maximum amount of force morning people could produce remained the same.
- The excitability of reflex pathways that travel through the spinal cord increased over the day for both groups.
- These findings show that nervous-system functions are different and have implications for maximizing human performance.

Their findings were published in the June edition of the *Journal of Biological Rhythms*.

The research team included students Alex Tamm, Olle Lagerquist, technician Alex Ley and neuroscientist Dave Collins

Adapted from materials provided by [University of Alberta](#), via [EurekAlert!](#), a service of AAAS

<http://www.sciencedaily.com/releases/2009/06/090623150621.htm>

Vaccines From The Bioreactor: Bioprocess Increases Vaccine Yield



Empa researchers have successfully scaled-up a new method of producing vaccines to enable the use of a bioreactor. (Credit: Image courtesy of Empa)

ScienceDaily (June 24, 2009) — Empa researchers have managed to adapt a process for manufacturing certain vaccines – in particular that against *Haemophilus influenzae* bacteria – for use in bioreactors, with the result that the yield is enhanced enormously. *Haemophilus influenzae* not only causes serious infection in the nose and throat, but can result in potentially fatal meningitis. The Swiss Federal Vaccination Commission therefore strongly recommends that children be vaccinated against this organism.

So-called conjugate vaccines have proven to be especially safe and effective in this respect. In this technique, antigens in the form of sugar chains (oligosaccharides) are chemically linked to carrier proteins in a complex process known as glycosylation.

Designer bacteria instead of chemical processes

A more elegant way, however, is to allow this task to be performed by specially designed, non-toxic *Escherichia coli* bacteria, which are normally present in the human gut. For this purpose GlycoVaxyn has developed an enzyme-based in vivo method. The *Escherichia coli* bacteria were genetically modified, so that they glycosylate certain proteins – in order words, they generate vaccine material. Unfortunately, however, the yield in the GlycoVaxyn process was too low. The vaccine manufacturer needed the help of specialists to upscale their process so it could be used in bioreactors. Their search came to an end in Empa's Biomaterials laboratory, where both the necessary know-how and the bioreactors were at hand.

From cell culture to bioreactor

“This is a classic biotechnology 'scale-up-problem'. It is not simply a question of multiplying everything by a hundred,” explains Empa expert Julian Ihssen. “On a large scale everything becomes more difficult. At higher cell densities many factors change.” For example, *Escherichia coli* bacteria begin to produce acetic acid. The oxygen supply is also no longer optimal. This makes the results very difficult to predict.



The Empa researchers discovered that the production of the glycoconjugate, i.e. the vaccine itself, was influenced by both the type of culture medium used as well as the way the process steps were controlled. Several different process sequences were tried out, with the best turning out to be a «fed-batch» strategy involving the periodic addition of glycerol as the main nutrient.

A significantly higher vaccine yield

The novel bioprocess resulted in a forty times increase in the biomass concentration – that is, the bacterial cell density – compared to the previously employed shaken flask technique. At the same time each individual bacteria produced on average somewhat more vaccine than before, so that all told the yield in purified conjugated vaccine rose from 0.6 to over 30 milligrams per liter of culture medium, an increase of about a factor fifty. “The results using a three liter bioreactor were very promising. Now we are hoping to be able to scale up the principle even more to the industry standard level,” says GlycoVaxyn co-founder Michael Wacker.

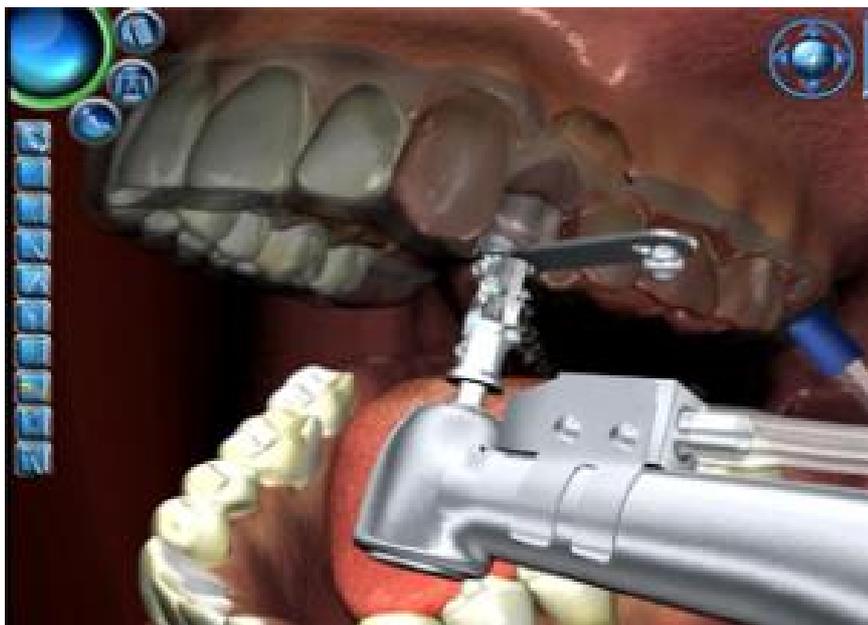
The same process can very likely also be used to manufacture other conjugated vaccines too, for instance against certain diarrhea producing organisms, or salmonella. This would above all offer a glimmer of hope to developing countries, where often vaccination campaigns fail because of the high price of vaccines.

Adapted from materials provided by Empa.

<http://www.sciencedaily.com/releases/2009/06/090612122455.htm>



Simulation Helps Students Learn Dental Implant Procedures



Virtual Dental Implant Training Simulation Program. (Credit: Image courtesy of Medical College of Georgia)

ScienceDaily (June 23, 2009) — A realistic computer game will soon be used to help dental students worldwide learn and reinforce dental implant procedures.

The Virtual Dental Implant Training Simulation Program is designed to help students in diagnostics, decision making and treatment protocols. It was designed by Medical College of Georgia School of Dentistry faculty and students and BreakAway, Ltd., a developer of game-based technology for training, experimentation and decision-making analysis.

"There's a lot of enthusiasm in the global dental and medical communities to use virtual reality and simulation as a tool to convey and reinforce information and ensure competency levels," says Dr. Roman Cibirka, MCG vice president for instruction and enrollment management and the program's project director. He presented the game and its 18-month development process today at the fifth annual Games for Health Conference in Boston.

Dental implants are tiny screws surgically placed in the jaw to act as artificial roots for prosthetic teeth. About 25 percent of adults 60 and older no longer have any natural teeth, according to the Centers for Disease Control and Prevention, and the need for this procedure could increase with the country's aging population.

"The program was an opportunity to align the defined need to enhance the depth and penetration of implant therapy knowledge in undergraduate dental education with my vision of using gaming to reach the millennial student," Dr. Cibirka says.

His highest priorities were instructional effectiveness, patient safety and a fun learning environment for the students.

Research shows that health care providers who practice clinical skills via simulation have better patient outcomes than those who don't.

The implant simulation game uses multiple patients and clinical scenarios that can be randomly selected, letting students interact with virtual patients by asking about their medical history, examining them and arriving at a diagnosis. Like humans, the virtual patients have different personalities, and students must tailor treatment based on the mental, physical and emotional needs of the individual.

If the virtual patient is a candidate for implant therapy, the simulation then ventures into a virtual clinical treatment area, where students decide the type, location and orientation of the implants, type and location of anesthesia and tools for surgery.

"It's realistic. If the student doesn't place anesthesia in the right spot, the patient screams," Dr. Cibirka says.

The game uses Pulse!! Virtual Learning Lab, developed by BreakAway in partnership with Texas A&M University-Corpus Christi through funding from the Office of Naval Research.

As effective as the learning tool is, it is intended to supplement – not replace – actual clinical training.

"It's anytime, anywhere education; a classroom without walls," Dr. Cibirka says. "I think it really fortifies the entire educational experience and capitalizes on the needs of this generation."

To ensure the game reaches the millennial generation, Dr. Cibirka brought students into the design process. Sarah Padolsky, a second-year MCG dental student, served as the student project manager. Student reviews have been overwhelmingly positive and added great value to the final product, says Dr. Cibirka, noting he also worked with a team of faculty subject matter experts to ensure educational accuracy.

The program was funded as part of a \$6.2 million contract between MCG and Nobel Biocare, a leading manufacturer of implants and equipment, which also established the School of Dentistry as a Nobel Biocare Center for Excellence.

The program is now being evaluated for functionality and instructional usefulness by more than 20 dental schools in the Nobel Biocare University Partnership Program. This summer it will be launched at 25 universities worldwide, potentially reaching 15,000 dental students, Dr. Cibirka says.

In most instances, the program will be used during the third and fourth years of dental education, depending on the curricula of each institution. Dr. Cibirka hopes it will be part of MCG's dental curriculum soon.

"We want the students that we graduate to be the best dentists they can be because they have learned better and feel more confident in the techniques they've learned, and this is another tool to do so," Dr. Cibirka says.

Adapted from materials provided by Medical College of Georgia.

<http://www.sciencedaily.com/releases/2009/06/090611084130.htm>

Hybrid Vehicles That Are Even More Efficient

Hybrid vehicles that are even more efficient. (Credit: Image courtesy of Universitat Politècnica de Catalunya)



ScienceDaily (June 23, 2009)

— One of the controllable causes of global warming is carbon dioxide (CO₂) emission from burning fossil fuels. This process is precisely what enables most cars to function by means of combustion engines. In recent years, some companies in the automobile sector have brought out models that combine a standard combustion engine with an electric one. These are known as hybrids, and they produce less pollution. In his final thesis, Toni Font, who recently graduated from the ETSEIB, proposed a way to make these vehicles more efficient.

The proposal is based on one of the problems of conventional vehicles: the loss of kinetic energy during braking. This waste of energy leads to very high fuel consumption and, consequently, to an increase in CO₂ emissions. Under the supervision of Ramon Costa, lecturer at the Department of Automatic Control (ESAI), Toni Font has focused on solving this problem. According to Ramon Costa, “The project modifies the structure of conventional cars to introduce elements that help to recover lost energy and reinject it into the system. It is made up of two parts: one related to hardware components, and one to software components”.

The study proposes the installation of a supercapacitor battery and the creation of software to coordinate and manage the new elements. The supercapacitors facilitate the work of the battery, as they prevent current peaks that can diminish performance and transfer the remaining energy. The software envisages four operational modes for the vehicle, which depend on the propulsion system. As the most suitable motor is activated for the type of driving, this technology brings about energy savings and reduces CO₂ emissions. In a standard driving cycle, the modifications lead to up to 67% less fuel consumption and up to 63% less energy consumption than a conventional vehicle of the same size with no hybrid components. In addition, it uses 55% less energy than a standard hybrid vehicle.

Energy and transport management

With respect to the applications of his work, Toni Font explained that, “It could be used in sectors related to energy generation and management that aim to work in the most sustainable and efficient way possible. It could also be applied to the areas of the transport sector that use petrol and diesel motors”.

As a result of this research, Toni Font has received one of the six research grants that Ferrari will award in 2009, in the category of CO₂ emissions reduction. The ETSEIB student is the only Spaniard to participate in the programme, which is funded by the Maranello-based company.

Adapted from materials provided by Universitat Politècnica de Catalunya.

<http://www.sciencedaily.com/releases/2009/06/090611112651.htm>

Can Health Care Come With a Warranty?

By PAULINE W. CHEN, M.D.



From the time I was in grade school until just a few years ago, my parents owned a series of small neighborhood businesses. The first was a corner convenience store in an Italian neighborhood; eventually they traded up to three small clothing shops situated in neighborhood malls. Whether posted above the register or acknowledged during conversations, the message behind each transaction in every one of these stores was this: you were getting the best service and quality my parents could muster or you would get your money back.

Few people ever asked. My parents understood the power of warranties and developed a small army of loyal customers with relationships based not on money but on trust.

So I was more than intrigued last week when I read about the possibility of offering warranties to patients.

In the policy journal Health Affairs, Francois de Brantes, a nationally known advocate of health care quality, and his co-authors propose a new health care reimbursement model that comes with a warranty. Developed with the support of the Commonwealth Fund and the Robert Wood Johnson Foundation, this model, called Prometheus Payment, first offers set fees to providers. The fees cover all recommended services, treatments and procedures for specific conditions but are also “risk-adjusted” for patients who may be older or frail.

The warranty is based on the costs incurred by avoidable complications. In current fee-for-service plans, all costs from these complications are covered by the third party payer, regardless. But in the Prometheus Payment model, half of the costs from avoidable complications must be paid for by the providers themselves.

The result, Mr. de Brantes and his co-authors write, is a payment system that offers patients a health care warranty, since “providers win or lose financially based on their actual performance in reducing the incidence of avoidable complications.”



I spoke recently with Mr. de Brantes and asked him about the Prometheus Plan, the feasibility of a warranty in the imperfect endeavor called “health care,” and the potential impact such a plan might have on the patient-doctor relationship.

Q. Why a health care warranty?

A. There are no warranties in health care today because everything is paid fee-for-service. And that is the underlying problem with escalating costs.

A warranty means that you are going to think in terms of the customer’s experience and perceptions. In health care, you would need to start thinking about the care patients have when they need it, not in terms of an artificial payment construct or a third party payer system.

One example of health care with a warranty is orthodontic braces. You don’t pay for every visit but for the entire period of care. And if the teeth don’t come out right, the orthodontist will take care of you. The focus is on the patient, the consumer, and that is what Prometheus Payment is trying to create for the rest of the health care world.

The industry pushback, however, has been that patients are not widgets, so there is no way we can guarantee an error-free world. But that hypothesis has been debunked by health care organizations that have already successfully offered care similar to the Prometheus model, organizations like the Geisinger Health System in Pennsylvania.

Q. You write about separating different types of risk in the Prometheus Payment model. Could you explain?

A. In health care currently, all risks have been mixed together in a gigantic pot. But we know that part of the total cost incurred is because of patients (inherent risk factors, biological risk factors), and another part of the cost is because of health care providers (how that patient is managed).

Take, for example, a patient with breast cancer who ends up with multiple biopsies because the laboratories don’t read her pathology correctly. There are a whole series of costs not because the patient has cancer but because she has had bad care.

In splitting those risks apart, you can offer this patient a warranty. If you can quantify each of those problems and their costs, it becomes a lot easier to create responsibility for each part. And we’ve done this for six of the biggest chronic conditions and several procedures.

Q. A warranty presupposes a certain degree of perfection, or “zero defects,” but both patients and providers are susceptible to human error. Is that a problem?

A. While I agree that aiming for zero defects will be incredibly difficult or impossible to achieve, right now over 70 percent of patients have at least one insurance claim that is attributable to an avoidable complication.

What we’re saying is let’s try to cut that in half to at least 50 percent, and let’s give health care providers incentives to reduce these avoidable complications.

Q. Will this type of payment model encourage providers to refuse or skimp on testing in order to save money?

A. Our message is not to withhold tests but to give your patients the care that they need.



The likelihood, too, is that the care they need won't be just the amount you were planning to give. For example, what we see in our data is that there are not enough office visits for patients with diabetes, high blood pressure or congestive heart failure. As a result these patients end up in the hospital. Our payment plan would want you to spend more time with them in order to reduce the number of hospitalizations.

The warranty is based on reducing the costs associated with avoidable complications. That is a very different message from one that asks providers to reduce all costs.

Q. Will a health care warranty change the relationship between patients and doctors?

A. This type of payment model will create more of a team not only between doctors and patients but also between doctors, patients and payers.

Right now you have hundreds of thousands of dedicated and devoted professionals who want nothing else but to apply their knowledge and skills for the betterment of their fellow human being; yet every day they go to work and the entire system militates against their desires of doing the best for their patients. Right now you have 50 to 80 percent of diabetic patients with an encounter that is caused by an avoidable complication; yet it is not because clinicians aren't trying their best. The odds are simply stacked against them.

What we are proposing is a system that makes it profitable to do the right thing for patients systematically. Our system is not that complicated, but it will require a significant amount of effort on the parts of everyone.

Q. Do you need to be part of a large health care organization in order to offer this kind of warranty?

A. I fundamentally don't believe you need large integrated systems to make this model work. It doesn't have to be bigger to be better. In this country we already have so many examples of small and large physician practices and hospitals that deliver very close to defect-free care. Our job collectively, particularly on the payer side, is to pay them so it reinforces that behavior every day.

<http://www.nytimes.com/2009/06/25/health/25chen.html?ref=health>



Does Exercise Really Keep Us Healthy?

By GINA KOLATA



Kevin Moloney for The New York Times

Kaoko Obata, a Japanese marathoner, runs at the Boulder Reservoir in Colorado.

In Brief:

While exercise can boost mood, its health benefits have been oversold.

Moderate exercise can reduce the risk of diabetes in people at risk. Exercise may reduce the risk of heart disease and breast and colon cancers.

Though the evidence is mixed, exercise may also provide benefits for people with osteoporosis.

Physical activity alone will not lead to sustained weight loss or reduce blood pressure or cholesterol.

Exercise has long been touted as the panacea for everything that ails you. For better health, simply walk for 20 or 30 minutes a day, boosters say — and you don't even have to do it all at once. Count a few minutes here and a few there, and just add them up. Or wear a pedometer and keep track of your steps. However you manage it, you will lose weight, get your blood pressure under control and reduce your risk of osteoporosis.

If only it were so simple. While exercise has undeniable benefits, many, if not most, of its powers have been oversold. Sure, it can be fun. It can make you feel energized. And it may lift your mood. But before you turn to a fitness program as the solution to your particular health or weight concern, consider what science has found.

Moderate exercise, such as walking, can reduce the risk of diabetes in obese and sedentary people whose blood sugar is starting to rise. That outcome was shown in a large federal study in which participants were randomly assigned either to an exercise and diet program, to take a diabetes drug or to serve as controls. Despite trying hard, those who dieted and worked out lost very little weight. But they did manage to maintain a regular walking program, and fewer of them went on to develop diabetes.

Exercise also may reduce the risk of heart disease, though the evidence is surprisingly mixed. There seems to be a threshold effect: Most of the heart protection appears to be realized by people who go from

being sedentary to being moderately active, usually by walking regularly. More intense exercise has been shown to provide only slightly greater benefits. Yet the data from several large studies have not always been clear, because those who exercise tend to be very different from those who do not.

Active people are much less likely to smoke; they're thinner and they eat differently than their sedentary peers. They also tend to be more educated, and education is one of the strongest predictors of good health in general and a longer life. As a result, it is impossible to know with confidence whether exercise prevents heart disease or whether people who are less likely to get heart disease are also more likely to be exercising.

Scientists have much the same problem evaluating exercise and cancer. The same sort of studies that were done for heart disease find that people who exercised had lower rates of colon and breast cancer. But whether that result is cause or effect is not well established.

Exercise is often said to stave off osteoporosis. Yet even weight-bearing activities like walking, running or lifting weights has not been shown to have that effect. Still, in rigorous studies in which elderly people were randomly assigned either to exercise or maintain their normal routine, the exercisers were less likely to fall, perhaps because they got stronger or developed better balance. Since falls can lead to fractures in people with osteoporosis, exercise may prevent broken bones — but only indirectly.

And what about weight loss? Lifting weights builds muscles but will not make you burn more calories. The muscle you gain is minuscule compared with the total amount of skeletal muscle in the body. And muscle has a very low metabolic rate when it's at rest. (You can't flex your biceps all the time.)

Jack Wilmore, an exercise physiologist at Texas A & M University, calculated that the average amount of muscle that men gained after a serious 12-week weight-lifting program was 2 kilograms, or 4.4 pounds. That added muscle would increase the metabolic rate by only 24 calories a day.

Exercise alone, in the absence of weight loss, has not been shown to reduce blood pressure. Nor does it make much difference in cholesterol levels. Weight loss can lower blood pressure and cholesterol levels, but if you want to lose weight, you have to diet as well as exercise. Exercise alone has not been shown to bring sustained weight loss. Just ask Steven Blair, an exercise researcher at the University of South Carolina. He runs every day and even runs marathons. But, he adds, "I was short, fat and bald when I started running, and I'm still short, fat and bald. Weight control is difficult for me. I fight the losing battle."

The difficulty, Dr. Blair says, is that it's much easier to eat 1,000 calories than to burn off 1,000 calories with exercise. As he relates, "An old football coach used to say, 'I have all my assistants running five miles a day, but they eat 10 miles a day.'"

<http://health.nytimes.com/ref/health/healthguide/esn-exercise-ess.html>

Deep in Bedrock, Clean Energy and Quake Fears

By **JAMES GLANZ**



BASEL, Switzerland — Markus O. Häring, a former oilman, was a hero in this city of medieval cathedrals and intense environmental passion three years ago, all because he had drilled a hole three miles deep near the corner of Neuhaus Street and Shafer Lane.

He was prospecting for a vast source of clean, renewable energy that seemed straight out of a Jules Verne novel: the heat simmering within the earth's bedrock.

All seemed to be going well — until Dec. 8, 2006, when the project set off an earthquake, shaking and damaging buildings and terrifying many in a city that, as every schoolchild here learns, had been devastated exactly 650 years before by a quake that sent two steeples of the Münster Cathedral tumbling into the Rhine.

Hastily shut down, Mr. Häring's project was soon forgotten by nearly everyone outside Switzerland. As early as this week, though, an American start-up company, AltaRock Energy, will begin using nearly the same method to drill deep into ground laced with fault lines in an area two hours' drive north of San Francisco.

Residents of the region, which straddles Lake and Sonoma Counties, have already been protesting swarms of smaller earthquakes set off by a less geologically invasive set of energy projects there. AltaRock officials said that they chose the spot in part because the history of mostly small quakes reassured them that the risks were limited.

Like the effort in Basel, the new project will tap geothermal energy by fracturing hard rock more than two miles deep to extract its heat. AltaRock, founded by Susan Petty, a veteran geothermal researcher, has secured more than \$36 million from the Energy Department, several large venture-capital firms, including Kleiner Perkins Caufield & Byers, and Google. AltaRock maintains that it will steer clear of large faults and that it can operate safely.

But in a report on seismic impact that AltaRock was required to file, the company failed to mention that the Basel program was shut down because of the earthquake it caused. AltaRock claimed it was uncertain that the project had caused the quake, even though Swiss government seismologists and officials on the Basel project agreed that it did. Nor did AltaRock mention the thousands of smaller earthquakes induced by the Basel project that continued for months after it shut down.

The California project is the first of dozens that could be operating in the United States in the next several years, driven by a push to cut emissions of heat-trapping gases and the Obama administration's support for renewable energy.

Geothermal's potential as a clean energy source has raised huge hopes, and its advocates believe it could put a significant dent in American dependence on fossil fuels — potentially supplying roughly 15 percent of the nation's electricity by 2030, according to one estimate by Google. The earth's heat is always there waiting to be tapped, unlike wind and solar power, which are intermittent and thus more fickle. According to a 2007 geothermal report financed by the Energy Department, advanced geothermal power could in theory produce as much as 60,000 times the nation's annual energy usage. President Obama, in a news conference Tuesday, cited geothermal power as part of the "clean energy transformation" that a climate bill now before Congress could bring about.

Dan W. Reicher, an assistant energy secretary in the Clinton administration who is now director of climate change and energy at Google's investment and philanthropic arm, said geothermal energy had "the potential to deliver vast amounts of power almost anywhere in the world, 24/7."

Power companies have long produced limited amounts of geothermal energy by tapping shallow steam beds, often beneath geysers or vents called fumaroles. Even those projects can induce earthquakes, although most are small. But for geothermal energy to be used more widely, engineers need to find a way to draw on the heat at deeper levels percolating in the earth's core.

Some geothermal advocates believe the method used in Basel, and to be tried in California, could be that breakthrough. But because large earthquakes tend to originate at great depths, breaking rock that far down carries more serious risk, seismologists say. Seismologists have long known that human activities can trigger quakes, but they say the science is not developed enough to say for certain what will or will not set off a major temblor.

Even so, there is no shortage of money for testing the idea. Mr. Reicher has overseen a \$6.25 million investment by Google in AltaRock, and with more than \$200 million in new federal money for geothermal, the Energy Department has already approved financing for related projects in Idaho by the University of Utah; in Nevada by Ormat Technologies; and in California by Calpine, just a few miles from AltaRock's project.

Steven E. Koonin, the under secretary for science at the Energy Department, said the earthquake issue was new to him, but added, "We're committed to doing things in a factual and rigorous way, and if there is a problem, we will attend to it."

The tone is more urgent in Europe. "This was my main question to the experts: Can you exclude that there is a major earthquake triggered by this man-made activity?" said Rudolf Braun, chairman of the project team that the City of Basel created to study the risks of resuming the project.

"I was quite surprised that all of them said: 'No, we can't. We can't exclude it,'" said Mr. Braun, whose study is due this year.

"It would be just unfortunate if, in the United States, you rush ahead and don't take into account what happened here," he said.

Basel's Big Shock

By the time people were getting off work amid rain squalls in Basel on Dec. 8, 2006, Mr. Häring's problems had already begun. His incision into the ground was setting off small earthquakes that people were starting to feel around the city.

Mr. Häring knew that by its very nature, the technique created earthquakes because it requires injecting water at great pressure down drilled holes to fracture the deep bedrock. The opening of each fracture is, literally, a tiny earthquake in which subterranean stresses rip apart a weak vein, crack or fault in the rock. The high-pressure water can be thought of loosely as a lubricant that makes it easier for those forces to slide the earth along the weak points, creating a web or network of fractures.

Mr. Häring planned to use that network as the ultimate teapot, circulating water through the fractures and hoping it emerged as steam. But what surprised him that afternoon was the intensity of the quakes because advocates of the method believe they can pull off a delicate balancing act, tearing the rock without creating larger earthquakes.

Alarmed, Mr. Häring and other company officials decided to release all pressure in the well to try to halt the fracturing. But as they stood a few miles from the drill site, giving the orders by speakerphone to workers atop the hole, a much bigger jolt shook the room.

"I think that was us," said one stunned official.

Analysis of seismic data proved him correct. The quake measured 3.4 — modest in some parts of the world. But triggered quakes tend to be shallower than natural ones, and residents generally describe them as a single, explosive bang or jolt — often out of proportion to the magnitude — rather than a rumble. Triggered quakes are also frequently accompanied by an “air shock,” a loud tearing or roaring noise. The noise “made me feel it was some sort of supersonic aircraft going overhead,” said Heinrich Schwendener, who, as president of Geopower Basel, the consortium that includes Geothermal Explorers and the utility companies, was standing next to the borehole.

“It took me maybe half a minute to realize, hey, this is not a supersonic plane, this is my well,” Mr. Schwendener said.

By that time, much of the city was in an uproar. In the newsroom of the city’s main paper, *Basler Zeitung*, reporters dived under tables and desks, some refusing to move until a veteran editor barked at them to get the story, said Philipp Loser, 28, a reporter there.

Aysel Mermer, 25, a waitress at the Restaurant Schiff near the Rhine River, said she thought a bomb had gone off.

Eveline Meyer, 44, a receptionist at a maritime exhibition, was on the phone with a friend and thought that her washing machine had, all by itself, started clattering with an unbalanced load. “I was saying to my friend, ‘Am I now completely nuts?’” Ms. Meyer recalled. Then, she said, the line went dead.

Mr. Häring was rushed to police headquarters in a squad car so he could explain what had happened. By the time word slipped out that the project had set off the earthquake, Mr. Loser said, outrage was sweeping the city. The earthquakes, including three more above magnitude 3, rattled on for about a year — more than 3,500 in all, according to the company’s sensors.

Although no serious injuries were reported, Geothermal Explorers’ insurance company ultimately paid more than \$8 million in mostly minor damage claims to the owners of thousands of houses in Switzerland and in neighboring Germany and France.

Optimism and Opportunity

In the United States, where the Basel earthquakes received little news coverage, the fortunes of geothermal energy were already on a dizzying rise. The optimistic conclusions of the Energy Department’s geothermal report began driving interest from investors, as word trickled out before its official release.

In fall 2006, after some of the findings were presented at a trade meeting, Trae Vassallo, a partner at the firm Kleiner Perkins, phoned Ms. Petty, the geothermal researcher who was one of 18 authors on the report, according to e-mail messages from both women. That call eventually led Ms. Petty to found AltaRock and bring in, by Ms. Petty’s tally, another six of the authors as consultants to the company or in other roles.

J. David Rogers, a professor and geological engineer at the Missouri University of Science and Technology who was not involved in the report, said such overlap of research and commercial interests was common in science and engineering but added that it might be perceived as a conflict of interest. “It’s very, very satisfying to see something go from theory to application to actually making money and being accepted by society,” Professor Rogers said. “It’s what every scientist dreams of.”

Ms. Petty said that her first “serious discussions” with Ms. Vassallo about forming a company did not come until the report was officially released in late January 2007. That June, Ms. Petty founded AltaRock with \$4 million from Kleiner Perkins and Khosla Ventures, an investment firm based in California.

The Basel earthquake hit more than a month before the Energy Department’s report came out, but no reference to it was included in the report’s spare and reassuring references to earthquake risks. Ms. Petty said the document had already been at the printer by the fall, “so there was no way we could have included the Basel event in the report.”

Officials at AltaRock, with offices in Sausalito, Calif., and Seattle, insist that the company has learned the lessons of Basel and that its own studies indicate the project can be carried out safely. James T. Turner, AltaRock’s senior vice president for operations, said the company had applied for roughly 20 patents on ways to improve the method.

Mr. Turner also asserted in a visit to the project site last month that AltaRock’s monitoring and fail-safe systems were superior to those used in Basel.

“We think it’s going to be pretty neat,” Mr. Turner said as he stood next to a rig where the company plans to drill a hole almost two and a half miles deep. “And when it’s successful, we’ll have a good-news story that says we can extend geothermal energy.”

AltaRock, in its seismic activity report, included the Basel earthquake in a list of temblors near geothermal projects, but the company denied that it had left out crucial details of the quake in seeking approval for the project in California. So far, the company has received its permit from the federal Bureau of Land Management to drill its first hole on land leased to the Northern California Power Agency, but still awaits a second permit to fracture rock.

“We did discuss Basel, in particular, the 3.4 event, with the B.L.M. early in the project,” Mr. Turner said in an e-mail response to questions after the visit.

But Richard Estabrook, a petroleum engineer in the Ukiah, Calif., field office of the land agency who has a lead role in granting the necessary federal permits, gave a different account when asked if he knew that the Basel project had shut down because of earthquakes or that it had induced more than 3,500 quakes.

“I’ll be honest,” he said. “I didn’t know that.”

Mr. Estabrook said he was still leaning toward giving approval if the company agreed to controls that could stop the work if it set off earthquakes above a certain intensity. But, he said, speaking of the Basel project’s shutdown, “I wish that had been disclosed.”

Bracing for Tremors

There was a time when Anderson Springs, about two miles from the project site, had few earthquakes — no more than anywhere else in the hills of Northern California. Over cookies and tea in the cabin his family has owned since 1958, Tom Grant and his sister Cynthia Lora reminisced with their spouses over visiting the town, once famous for its mineral baths, in the 1940s and ’50s. “I never felt an earthquake up here,” Mr. Grant said .

Then came a frenzy of drilling for underground steam just to the west at The Geysers, a roughly 30-square-mile patch of wooded hills threaded with huge, curving tubes and squat power plants. The Geysers is the nation’s largest producer of traditional geothermal energy. Government seismologists confirm that earthquakes were far less frequent in the past and that the geothermal project produces as many as 1,000 small earthquakes a year as the ground expands and contracts like an enormous sponge with the extraction of steam and the injection of water to replace it.

These days, Anderson Springs is a mixed community of working class and retired residents, affluent professionals and a smattering of artists. Everyone has a story about earthquakes. There are cats that suddenly leap in terror, guests who have to be warned about tremors, thousands of dollars of repairs to walls and cabinets that just do not want to stay together.

Residents have been fighting for years with California power companies over the earthquakes, occasionally winning modest financial compensation. But the obscure nature of earthquakes always gives the companies an out, says Douglas Bartlett, who works in marketing at Bay Area Rapid Transit in San Francisco, and with his wife, Susan, owns a bungalow in town.

“If they were creating tornadoes, they would be shut down immediately,” Mr. Bartlett said. “But because it’s under the ground, where you can’t see it, and somewhat conjectural, they keep doing it.”

Now, the residents are bracing for more. As David Oppenheimer, a seismologist at the United States Geological Survey in Menlo Park, Calif., explains it, The Geysers is heated by magma welling up from deep in the earth. Above the magma is a layer of granite-like rock called felsite, which transmits heat to a thick layer of sandstone-like material called graywacke, riddled with fractures and filled with steam.

The steam is what originally drew the power companies here. But the AltaRock project will, for the first time, drill deep into the felsite. Mr. Turner said that AltaRock, which will drill on federal land leased by the Northern California Power Agency, had calculated that the number of earthquakes felt by residents in Anderson Springs and local communities would not noticeably increase.

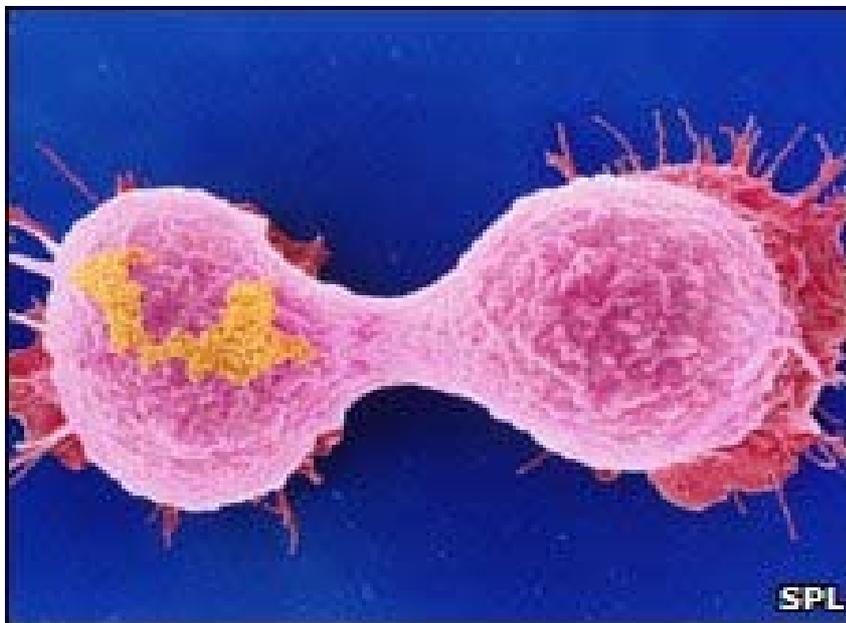
But many residents are skeptical.

“It’s terrifying,” said Susan Bartlett, who works as a new patient coordinator at the Pacific Fertility Center in San Francisco. “What’s happening to all these rocks that they’re busting into a million pieces?”

<http://www.nytimes.com/2009/06/24/business/energy-environment/24geotherm.html?ref=science>

New cancer drug 'shows promise'

Researchers say a new type of cancer treatment has produced highly promising results in preliminary drug trials.



Olaparib was given to 19 patients with inherited forms of advanced breast, ovarian and prostate cancers caused by mutations of the BRCA1 and BRCA2 genes.

In 12 of the patients - none of whom had responded to other therapies - tumours shrank or stabilised.

The study, led by the Institute of Cancer Research, features in the New England Journal of Medicine.

CASE STUDY

Julian Lewis, 62, was treated with olaparib after being diagnosed with advanced prostate cancer. Within a month or two levels of a key chemical marker of cancer went down to a low level, and have now stayed low for more than two years. In addition, secondary tumours in his bones have almost disappeared. He has experienced minor side-effects, such as stomach discomfort and mild nausea, but he said: "I hope to carry on with this for as long as possible. Partly the aim is the obvious one of keeping my cancer cells in check, but there's a broader goal too: to help find out how long this drug can be used safely in other people."

One of the first patients to be given the treatment is still in remission after two years.

Olaparib - a member of a new class of drug called PARP inhibitors - targets cancer cells, but leaves healthy cells relatively unscathed.

The researchers, working with the pharmaceutical company AstraZeneca, found that patients experienced very few side-effects, and some reported the treatment was "much easier than chemotherapy".

Researcher Dr Johann de Bono said the drug should now be tested in larger trials.

He said: "This drug showed very impressive results in shrinking patients' tumours.

"It's giving patients who have already tried many conventional treatments long periods of remission, free from the symptoms of cancer or major side-effects."

Olaparib is the first successful example of a new type of personalised medicine using a technique called "synthetic lethality" - a subtle way of exploiting the body's own molecular weaknesses for positive effect.

In this case the drug takes advantage of the fact that while normal cells have several different ways of repairing damage to their DNA, one of these pathways is disabled by the BRCA mutations in tumour cells.

Olaparib blocks one of the repair pathways by shutting down a key enzyme called PARP.

BRCA MUTATIONS

BRCA1 or BRCA2 mutations weaken the cells' ability to repair DNA damage

They are thought to be responsible for about 5% of breast and ovarian cancers, and about 1-2% of early onset prostate cancers

Women with a BRCA mutation have a risk of up to 85% on breast cancer, and up to 60% on ovarian cancer

Men with a BRCA mutation have a risk of up to 15% on prostate cancer

This does not affect normal cells because they can call on an alternative repair mechanism, controlled by their healthy BRCA genes.

But in tumours cells, where the BRCA pathway is disabled by genetic mutation, there is no alternative repair mechanism, and the cells die.

Cancer cells with the BRCA1 or BRCA2 mutations are the first to be shown to be sensitive to PARP inhibitors.

But there is evidence that olaparib will also be effective in other cancers with different defects in the repair of DNA.

Professor Stan Kaye, who also worked on the study, said: "The next step is to test this drug on other more common types of ovarian and breast cancers where we hope it will be just as effective."

The researchers say the process of drug evaluation and registration may have to be revamped to take consideration of the fact that new generation cancer drugs target specific molecular defects, rather than types of cancer.

Dr Peter Sneddon, of the charity Cancer Research UK, said: "It is very encouraging to see the development of 'personalised treatment', tailored to the requirements of the individual patient, becoming a reality as it offers the opportunity to design new drugs that are truly selective.

"Although development of this drug is in its early stages, it is very exciting to see that it has the potential to work when other treatment options have failed."

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8116790.stm>

Published: 2009/06/24 23:09:10 GMT

OLPC software to power aging PCs

Software originally developed for the One Laptop per Child (OLPC) project can now be used on any old PC.



Sugar on a stick, as it is known, can be run from a USB drive to give aging PCs a new interface and access to collaborative educational software.

The software, designed for use by children, was launched at the LinuxTag conference in Berlin.

It has been developed by Sugar Labs, a breakaway organisation from OLPC.

"[Sugar on a stick] is a great new opportunity to breathe new life into these old machines," Walter Bender, founder of Sugar Labs, told BBC News.

The release could dramatically increase the use of the free software, which has until now been predominantly distributed with the XO laptop, the machine sold by OLPC.

The child-friendly computers, originally marketed as the \$100 (£60) laptop, currently cost \$199 (£120) each. Sugar on a stick, however, can be used on any machine.

"It runs on Asus, Dell, HP - it runs on anything," said Mr Bender. "It even runs on phones."

It has already been shown working on an Intel Classmate PC, one of the main rivals to the OLPC machines.

Sweet release

Mr Bender was formerly second in command at OLPC. He left in April 2008 after it was announced that the low-cost laptops would be offering Microsoft Windows software.

"I didn't leave OLPC because of the Microsoft deal - it was a symptom rather than the cause," he told BBC News at the time.

"I left OLPC because I think the most important thing it is doing is defining a learning ecosystem."

Mr Bender went on to found Sugar Labs, an independent effort to develop the software and interface used on the OLPC machines.

The interface emphasises collaborative learning, allowing children to share material between different machines. For example, they can write documents or make music together.

The open source software also contains a journal and automatically saves and backs up all data.

It has been used by more than one million children on the XO laptop and has also been released as part of other operating systems. For example, it was bundled with releases of the Ubuntu and Fedora Linux systems.

The latest release - Sugar on a Stick - allows anyone to run the software from a 1GB USB stick. It includes 40 programs, including a word processor, drawing application and games.

Mr Bender said the ability to transport the software and plug it into any computer would allow children to have a "consistent experience" wherever they worked.

"No matter what computer you have at home or at the library you're going to have the same use experience because you have sugar on a stick," he said.

The software can be downloaded for free from the Sugar Labs website. It can be run on Linux machines, as well as Macs and Windows PCs. Recent Mac users and older Windows machines must use an additional "helper CD" to allow the computer to boot-up from the USB stick.

The software will also be used to power newer versions of the XO laptop, shipped in the autumn. However, the new machines will not use Sugar as the primary interface.

Instead, they will have a traditional desktop and allow children to run Sugar as a separate application.

"Our current belief is that Sugar should have always been on a stick," an OLPC spokesperson told BBC News. "In our case it should have been an application on top of a native Linux.

"We have been working on decoupling Sugar from our hardware since [Mr Bender] left."

Mr Bender said that the statement from OLPC was based on a misunderstanding by Nicholas Negroponte - head of OLPC - about how Sugar worked. "What I think he meant was that Sugar should co-exist with traditional desktops," he told BBC News.

"Sugar always has and still does and will continue to do be able to co-exist with traditional desktops. He just never quite understood that."

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/8117064.stm>

Published: 2009/06/24 19:01:46 GMT

Evolution faster when it's warmer

By Victoria Gill
Science reporter, BBC News

Climate could have a direct effect on the speed of "molecular evolution" in mammals, according to a study.



Researchers have found that, among pairs of mammals of the same species, the DNA of those living in warmer climates changes at a faster rate.

These mutations - where one letter of the DNA code is substituted for another - are a first step in evolution.

The study, reported in Proceedings of the Royal Society B, could help explain why the tropics are so species-rich.

DNA can mutate and change imperceptibly every time a cell divides and makes a copy of itself.

But when one of these mutations causes a change that is advantageous for the animal - for example, rendering it resistant to a particular disease - it is often "selected for", or passed down to the next few generations of that same species.

Such changes, which create differences within a population but do not give rise to new species, are known as "microevolution".

The idea that microevolution happens faster in warmer environments is not new. But this is the first time the effect has been shown in mammals, which regulate their own body temperature.

"The result was unexpected," said Len Gillman from Auckland University of Technology, who led the study.

"We have previously found a similar result for plant species and other groups have seen it in marine animals. But since these are 'ectotherms' - their body temperature is controlled directly by the environment - everyone assumed that the effect was caused by climate altering their metabolic rate."

Scientists believe that this link between temperature and metabolic rate means that, in warmer climates, the germ cells that eventually develop into sperm and eggs divide more frequently.

"An increase in cell division provides more opportunities for mutations in the population over a given time," explained Dr Gillman.

"This increases the probability of advantageous mutations that are selected for within the species."

'Sister species'

"We suspected the same effect might be happening in mammals, because seasonal changes affect the animals' activity," Dr Gillman told BBC News.

He and his team compared the DNA of 130 pairs of mammals, looking at genetically similar "sister species" - where each of the pair lived at a different latitude or elevation.

They tracked changes in one gene that codes for a protein known as cytochrome b, comparing the same gene in each of the pair of mammals to a "reference" gene in a common ancestor.

By looking for mutations in the DNA code for this gene - each point where one letter in the code was substituted for another - the researchers were able to see which of the two mammals had "microevolved" faster.

Animals living in environments where the climate was warmer, had about 1.5 times more of these substitutions than the animals living in cooler environments.

Dr Gillman explained that, at higher latitudes where environments are colder and less productive, animals often conserve their energy - hibernating or resting to reduce their metabolic activity.

"In warmer climates annual metabolic activity is likely to be greater, so this will lead to more total cell divisions per year in the germline."

These results support the idea that high tropical biodiversity is caused by faster rates of evolution in warmer climates.

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8115464.stm>

Published: 2009/06/24 12:05:38 GMT

Many sharks 'facing extinction'

By Victoria Gill
Science reporter, BBC News

Many species of open ocean shark are under serious threat, according to an assessment by the International Union for Conservation of Nature (IUCN).



The Red list gives the status of 64 types of shark and ray, over 30% of which are threatened with extinction.

The authors, IUCN's Shark Specialist Group, say a main cause is overfishing.

Listed as endangered are two species of hammerhead shark, often subject to "finning" - a practice of removing the fins and throwing away the body.

This is the first time that IUCN Red List criteria, considered the world's most comprehensive inventory of the conservation status of plants and animals, have been used to classify open ocean, or pelagic, sharks and rays.

The list is part of an ongoing international scientific project to monitor the animals.

The authors classified a further 24% of the examined species as Near Threatened.

Sharks are "profoundly vulnerable" to overfishing, they say. This is principally because many species take several years to mature and have relatively few young.

"[But] despite mounting threats, sharks remain virtually unprotected on the high seas," said Sonja Fordham, deputy chair of the IUCN Shark Specialist Group and one of the editors of the report.

"[We have] documented serious overfishing of these species, in national and international waters. This demonstrates a clear need for immediate action on a global scale."

The UN Food and Agriculture Organization (FAO) recognised the potential threat to sharks over a decade ago, when it launched its "International Plan of Action for the Conservation and Management of Sharks" in 1999.

But the "requested improvements fisheries data from member states... have been painfully slow and simply inadequate", according to this report by the IUCN.

"There have been improvements here and there but overall progress hasn't been as swift as we might like to see," said Jorge Csirke, director of the FAO's Fisheries and Aquaculture Management Division.

"Very often the reason is not a lack of will - although that can be a problem - but a lack of know-how and, most critically, a lack of budgetary resources for improving fisheries data collection.

Many pelagic sharks are caught in high seas tuna and swordfish fisheries.

Although some are accidentally caught in nets meant for these other fish, they are increasingly targeted for their meat, teeth and liver oil, and because of high demand, particularly in Asia, for their fins.

Discarded bodies

"The hammerheads are special because they have very high quality fins but quite low quality meat," explained Ms Fordham. "They often fall victim to finning."

She told BBC News that, although finning is widely banned, this ban is not always well enforced.

“ We've already had recommendations from scientists that there should be no fishing of these sharks ”

Sonja Fordham IUCN Shark Specialist Group

"The EU finning ban is one of the weakest in the world," she said.

"The best, most sure-fire way to enforce a ban is to prohibit the removal of fins at sea.

"But in the EU, you can remove them, providing the fins you bring ashore weigh less than 5% of the weight of the bodies."

This rule was designed to prevent finning, but it provided "wobble room", said Ms Fordham.

"The IUCN has estimated that, under these rules, you could fin and discard two to three sharks for every shark you keep, " she explained.

The European Commission agreed that EU policy on finning "contained a number of loopholes".

"That's why in February we proposed to strengthen the finning ban and close these loopholes," the commission said in a statement.

'No fishing'

Species listed as Vulnerable included the smooth hammerhead shark, the porbeagle shark and the common, bigeye and pelagic thresher sharks.



Fisheries have fought to keep their right to fish porbeagle sharks because their meat is so valuable, according to Ms Fordham.

"Yet we've already had recommendations from scientists that there should be no fishing of these sharks."

For certain species - that are considered particularly vulnerable - the authors have recommended their complete protection.

"The big-eyed thresher shark, for example, is very slow growing," explained Ms Fordham.

"Fishermen can very easily identify it, because it has a very big eye. So if they catch it accidentally, they can throw it back.

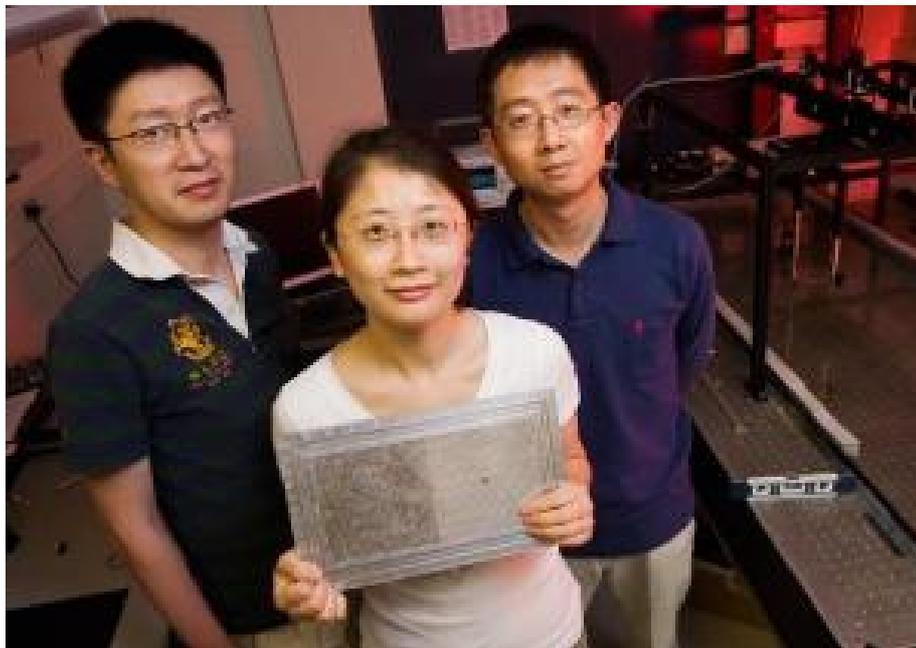
"These sharks tend to survive well when they're thrown back."

By the end of this year, the Shark Specialist Group will publish a complete report, outlining the status of all 400 species of shark, and closely-related skates and rays.

Story from BBC NEWS:
<http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8117378.stm>

Published: 2009/06/25 00:15:58 GMT

First Acoustic Metamaterial 'Superlens' Created



A team of Illinois researchers led by Nicholas X. Fang, left, a professor of mechanical science and engineering, have created the world's first acoustic "superlens." Doctoral student Shu Zhang holding the lens and Leilei Yin, a microscopist at Beckman Institute, were co-authors. (Credit: Photo by L. Brian Stauffer)

ScienceDaily (June 25, 2009) — A team of researchers at the University of Illinois has created the world's first acoustic "superlens," an innovation that could have practical implications for high-resolution ultrasound imaging, non-destructive structural testing of buildings and bridges, and novel underwater stealth technology.

The team, led by Nicholas X. Fang, a professor of mechanical science and engineering at Illinois, successfully focused ultrasound waves through a flat metamaterial lens on a spot roughly half the width of a wavelength at 60.5 kHz using a network of fluid-filled Helmholtz resonators.

According to the results, published in the May 15 issue of the journal *Physical Review Letters*, the acoustic system is analogous to an inductor-capacitor circuit. The transmission channels act as a series of inductors, and the Helmholtz resonators, which Fang describes as cavities that house resonating waves and oscillate at certain sonic frequencies almost as a musical instrument would, act as capacitors.

Fang said acoustic imaging is somewhat analogous to optical imaging in that bending sound is similar to bending light. But compared with optical and X-ray imaging, creating an image from sound is "a lot safer, which is why we use sonography on pregnant women," said Shu Zhang, a U. of I. graduate student who along with Leilei Yin, a microscopist at the Beckman Institute, are co-authors of the paper.

Although safer, the resultant image resolution of acoustic imaging is still not as sharp or accurate as conventional optical imaging.

"With acoustic imaging, you can't see anything that's smaller than a few millimeters," said Fang, who also is a researcher at the institute. "The image resolution is getting better and better, but it's still not as convenient or accurate as optical imaging."



The best tool for tumor detection is still the optical imaging, but exposure to certain types of electromagnetic radiation such as X-rays also has its health risks, Fang noted.

“If we wish to detect or screen early stage tumors in the human body using acoustic imaging, then better resolution and higher contrast are equally important,” he said. “In the body, tumors are often surrounded by hard tissues with high contrast, so you can’t see them clearly, and acoustic imaging may provide more details than optical imaging methods.”

Fang said that the application of acoustic imaging technology goes beyond medicine. Eventually, the technology could lead to “a completely new suite of data that previously wasn’t available to us using just natural materials,” he said.

In the field of non-destructive testing, the structural soundness of a building or a bridge could be checked for hairline cracks with acoustic imaging, as could other deeply embedded flaws invisible to the eye or unable to be detected by optical imaging.

“Acoustic imaging is a different means of detecting and probing things, beyond optical imaging,” Fang said.

Fang said acoustic imaging could also lead to better underwater stealth technology, possibly even an “acoustic cloak” that would act as camouflage for submarines. “Right now, the goal is to bring this ‘lab science’ out of the lab and create a practical device or system that will allow us to use acoustic imaging in a variety of situations,” Fang said.

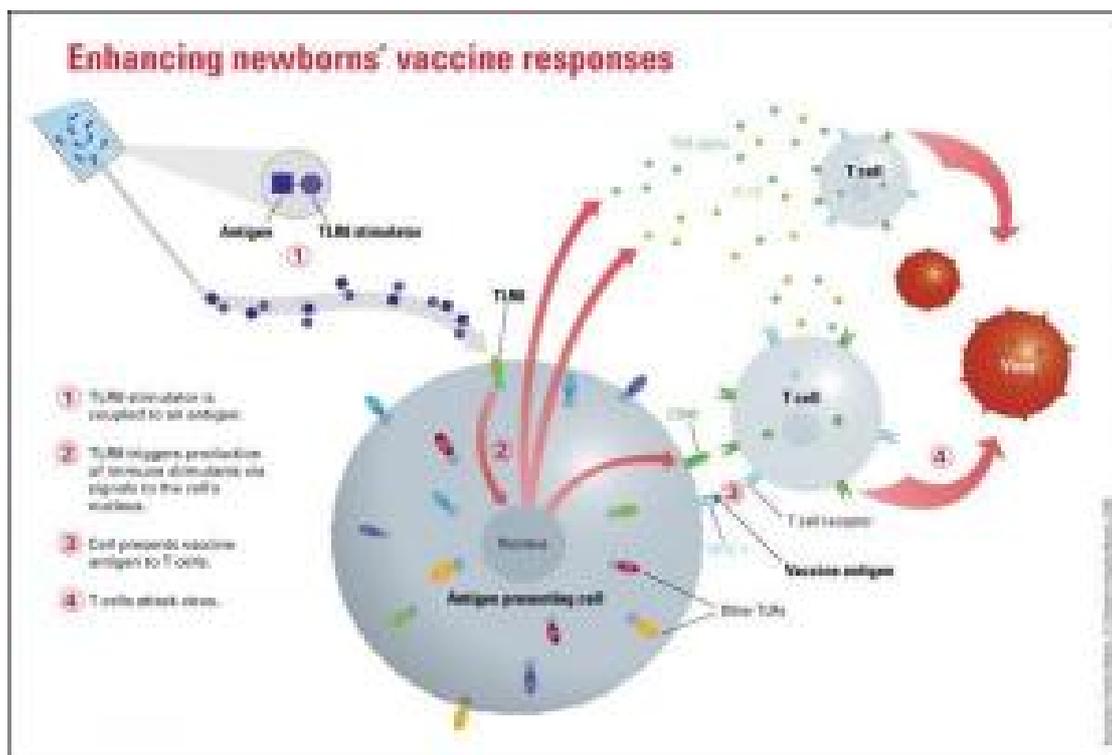
Funding for this research was provided by the Defense Advanced Research Projects Agency, the central research and development agency for the U.S. Department of Defense.

Adapted from materials provided by University of Illinois at Urbana-Champaign.

<http://www.sciencedaily.com/releases/2009/06/090624153116.htm>



Boosting Newborns' Immune Responses



Toll-like receptors (TLRs) on the surface of white blood cells provide a first line of defense against infection. But in newborns, most of them respond poorly -- except for TLR8. Levy and colleagues believe that agents that stimulate TLR8 could be given as vaccine adjuvants to enhance newborns' immune responses. (Credit: Illustration: Patrick Bibbins, Children's Hospital Boston)

ScienceDaily (June 25, 2009) — Newborn babies have immature immune systems, making them highly vulnerable to severe infections and unable to mount an effective immune response to most vaccines, thereby frustrating efforts to protect them. The World Health Organization estimates that more than 2 million newborns and infants less than 6 months of age die each year due to infection.

Researchers at Children's Hospital Boston believe they have found a way to enhance the immune system at birth and boost newborns' vaccine responses, making infections like respiratory syncytial virus, pneumococcus and rotavirus much less of a threat.

Ofer Levy, MD, PhD and colleagues in Children's Division of Infectious Diseases have shown that the newborn immune system functions differently than that of adults, but that one portion of the immune response is fully functional and can be harnessed to boost innate immunity in these tiny infants.

For more than a decade it's been known that people's first line of defense against infection is a group of receptors known as Toll-like receptors (TLRs) on the surface of certain white blood cells. Functioning like an early radar system, TLRs detect the presence of invading bacteria and viruses and signal other immune cells to mount a defense. People have 10 different kinds of TLRs, and Levy's team found that when most of them were stimulated, newborns' immune responses are very impaired -- with one important exception.

One TLR, known as TLR8, triggered a robust immune response in antigen-presenting cells, which are crucial for vaccine responses, suggesting that agents that stimulate TLR8 could be used to enhance



immune responses in newborns, perhaps as adjuvants given along with vaccines. With the help of a \$100,000 pilot grant from the Bill & Melinda Gates Foundation, Levy's team is now validating their work in human cells and in animal models, and eventually want to test TLR8 stimulators – some of which are already available -- in human babies.

Levy's team is uncovering other differences in the newborn immune system that could lead to additional targets for drugs or vaccines. "As we better understand the molecular pathways that account for newborns' susceptibility to infections, we can leverage them to enhance their immune defenses," Levy says.

The ability to vaccinate newborns -- rather than wait until they reach 2 months of age -- would provide important global health benefits, adds Levy, whose lab is one of the few in the world to specifically focus on vaccination in newborns. "Birth is a point of contact with healthcare systems," he says. "If you could give a vaccine at birth, a much higher percentage of the population can be covered."

Adapted from materials provided by Children's Hospital Boston, via Newswise.

<http://www.sciencedaily.com/releases/2009/06/090612201946.htm>

